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SUPPLEMENTS TO THE BULLETIN OF THE HISTORY OF MEDICINE

Editor: HENRY E. SIGERIST
Associate Editor: GENEVIEVE MILLER

No. 7

JEROME CARDAN

BY

JAMES ECKMAN

BALTIMORE
THE JOHNS HOPKINS PRESS
1946

Price: $2.00

For subscribers to the *Bulletin of the History of Medicine*: $1.75

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PRINTED IN THE UNITED STATES OF AMERICA
BY J. H. FURST COMPANY, BALTIMORE, MARYLAND

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We had almost forgot Jeronymus Cardanus, that famous physician of Milan, a great enquirer of truth, but too greedy a receiver of it. He hath left many excellent discourses, medical, natural, and astrological; the most suspicious are those two he wrote by admonition in a dream, that is, *De Subtilitate* and *Varietate Rerum*. Assuredly this learned man hath taken many things upon trust, and although he examined some, hath let slip many others. He is of singular use unto a prudent reader; but unto him that only desireth *hoties*, or to replenish his head with varieties, like many others before related, either in the original or confirmation, he may become no small occasion of error.

SIR THOMAS BROWNE [257]

AD

CHARLES CALLAN TANSILL

TIBOR KEREKES

FOREWORD

This study of Jerome Cardan underlines the peculiar importance of northern Italy and especially of the University of Padua in the history of modern science. Over the course of quite a few years now, successive groups of advanced students at the University of Minnesota, interested in a more intensive study of the Middle Ages, have chosen to work in the period of the Renaissance. And year by year, as this study has progressed, the extraordinary record of the University of Padua has become increasingly apparent. For within little more than a century this institution numbered among its students and professors Thomas Linacre, founder of the Royal College of Physicians in England, Andreas Vesalius from the Low Countries, founder of modern anatomy, Nicholas Copernicus of Poland, founder of modern astronomy, Georgius Agricola of Germany, first modern writer on mining and geology, William Harvey, discoverer of the circulation of blood, and Galileo Galilei, distinguished in so many fields of science. These are but a few of the great names associated with the University of Padua during the last half of the Renaissance period; and any university which could nurture so distinguished an array of talent deserves more than incidental mention in any age in which it flourished.

In its day, Padua, as this list of its scholars so eloquently reveals, enjoyed an international reputation unequalled by any other university of the time. It is the only university which Shakespeare chose to signalize, and, though he did recognize Oxford as a place of learning, it was Padua of which he said,

> To see fair Padua, nursery of arts
> . . . . . .
> Here let us breathe and haply institute
> A course of learning and ingenious studies.
> . . . . . .
> And therefore, Tranio, for the time I study,
> Virtue and that part of philosophy
> Will I apply that treats of happiness
> By virtue specially to be achieved.
> . . . . . for I have Pisa left
> And am to Padua come, as he that leaves
> A shallow plash to plunge him in the deep
> And with satiety seeks to quench his thirst.

And in these last lines another native of Pisa, Galileo, Shakespeare's contemporary, would doubtless have concurred, for he too left Pisa to go to Padua just as the English contemporary of Shakespeare, William Harvey, left Cambridge to complete his education at Padua.

But what the late sixteenth century so well knew became quite completely forgotten in the succeeding centuries. This singular record of what was essentially the state university of Venice has escaped the notice of nearly all those who have written extensively upon the Italian Renaissance. Sismondi, whose interest was politics, found little occasion to mention it. Burckhardt, whose primary interest was art, also overlooked it. Symonds, treating the period primarily from a literary point of view, failed likewise to notice it. Nor did Molmenti, historian of Venice, who had frequent occasion to mention the University of Padua, remark its peculiar distinction in this period. Even Thorndike, whose interest lies so close to the field of science, has failed to single out the University of Padua for special attention.

It was this remarkable record of Padua, however, which most deeply impressed the author of this volume when he was a member of that group of students studying the period of the Renaissance at the University of Minnesota. When he enrolled in that course he was already a mature scholar, was already on the staff of the Mayo Clinic, and his interest in the history of medicine and science was already well established. His work up to that time had been rather of an antiquarian than historical nature, if such a distinction has meaning, and it was doubtless a desire to broaden his field of investigation which led him to enroll in a course on the Renaissance. While his classmates reported on the political, economic, social, literary, artistic, and religious developments of the period, his contributions dealt mainly with the scientific aspects of the same age. In the give and take of class discussions, he discovered the integral relationship between the varied activities of science and learned that the course of scientific progress is usually as much affected by the political, economic, even religious and artistic activities of any period as these are, in turn, affected by the scientific development that may be going on at the same time.

The fruits of this experience are reflected in this more intensive study of Jerome Cardan, one of the alumni of Padua, which the author has carried forward at Georgetown University. Considering Cardan in the light of his times with due regard to the other major developments of society during that age, Captain Eckman has given us a better balanced

and truer appraisal of Cardan's achievements than we have thus far been able to draw upon. Few writers on the history of science, especially of these earlier centuries of that history, have possessed the knowledge of science, the knowledge of languages, and the knowledge of history essential to effective work in this field. This monograph indicates that the author is well on his way to command these essential pre-requisites. The first two chapters likewise reveal that the author has not lost his interest in the other scientists of the University of Padua. We may hope, therefore, for further work on this subject from him and that the University of Padua will not continue to receive the undeserved neglect which it has suffered during the past three centuries.

A. C. KREY

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Minneapolis, Minnesota

AUTHOR'S NOTE

This dissertation was written under the guidance of Dr. Olgerd P. de Sherbowitz-Wetzor, associate professor of history in the Georgetown University Graduate School. Almost all the substance represented in the work was obtained specifically for the problem involved; but a small part of it is *residuum* from an earlier work, never completed and never employed otherwise, that had been initiated under Dr. August C. Krey, professor of medieval history in the University of Minnesota.

The sources that have been utilized herein are primary, within certain definite limits. That is to say, in every case in which an original printed work is referred to, the author secured the work itself, or obtained rotographs or microfilm copies of the work. In many cases it was possible to repair directly to the original printed edition.

Especial gratitude is entertained toward Major Thomas E. Keys, officer in charge of the Rare Book Branch of the Army Medical Library in Cleveland, and toward his associate, Dr. Max H. Fisch, curator of rare books. Mr. Cosby Brinkley, chief of the Photoduplication Service of the Army Medical Library in Washington, has been of prime assistance. The British Museum in London, Charles Nowell, M. A., F. L. A., chief librarian of the Manchester Public Libraries in Manchester, England, the New York Academy of Medicine, the Library of Congress, the New York Public Library, the Harvard College Library, the Yale University Library, the John Crerar Library of Chicago, the Columbia University Libraries and the Army Medical Library of Washington all have most generously supplied the author with original works or with rotographs or microfilm or autographic copies of such works. Mr. Nowell was kind enough to supply the author with part of a copy of a letter written by Robert Southey (1774-1843), and not previously published, concerning Cardan. He was felicitously diligent, moreover, in helping the author to establish the fact that *The Life and Times of Jerome Cardan*, by James Crossley, 2 vols., 8vo., London, 1836, referred to by many previous writers on Cardan, actually does not exist in printed form.

The author's associates in the Medical Intelligence Division of the Preventive Medicine Service of the Office of The Surgeon General, United States Army, Washington, D. C., have provided much counsel of genuine value. Chief among them are Major Saul Jarcho, Captain George Rosen,

Captain Carlo Henze and Lieutenant Morris C. Leikind. The director of the Medical Intelligence Division, Lieutenant Colonel Gaylord West Anderson, made it possible for the author to repair to sources in the Library of Congress which otherwise would have been closed to him.

Miss Lottie Martin Roberts of the Medical Intelligence Division was kind enough to preserve the author from several errors which, undetected, would have produced philologic anarchy. Miss Bertha Brenner, late of the Medical Intelligence Division, displayed uncommon acumen in securing a number of valuable sources which surely would have been overlooked had it not been for her vigilance.

Publication of this monograph was made possible by the Board of Governors of the Mayo Clinic. To that body, and to Dr. Richard M. Hewitt, chief of the Division of Publications of the Mayo Clinic, to Miss Marcia Nutting of that division, and to the Misses Florence Schmidt and Jane Crawford who disengaged the author from many grievous snares by their superior proofreading, the author extends his gratitude.

JAMES ECKMAN

Washington, D. C.
8 November, 1944

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I.

REI EXPOSITIO

To write the life of one who was the delight of competent biographers is the vainest of labors. Mimicry, however sedulous, does not contribute much to the history of science. Especially are these things so when the figure in question is such a man as Jerome Cardan (1501-1576) of Milan, who left behind him the remarkable story of his life.

Yet there are several considerations which might impel the investigator of the history of science to undertake a re-appraisal of Cardan. Such a venture, it should be said at once, should be based upon the realization that Cardan's life actually has been recounted, by himself as well as by others, so completely and so satisfactorily that a new biographic study *per se* would be merely barren repetition. In the present chapter an effort will be made to present some conception of the mass of material concerning Cardan that has slowly accrued during the centuries since his time, and to set forth, finally, those factors which have suggested that a modern study of Cardan and his achievements might be a valid endeavor.

Cardan's autobiography, the *De Vita Propria Liber*, is not a particularly rare book, even in the original Latin. It was first published [1] in 1643 at Paris, only sixty-seven years after the death of Cardan. It was printed again [2] at Amsterdam in 1654, and again [3] at Lyons in 1663, as part of the first volume of the ten-volume * *Opera Omnia* of the author. The *De Vita Propria Liber* was first issued in Italian [4] † in 1821; in German [5] in 1914; in English [6] in 1930; in Italian [7] again in 1932; and in French [8] ** in 1936. The book has been variously appraised. Michéa [9] in 1853 said that " Pour le lecteur avide de couleur et de mouvement, pour le récit des scènes d'une vie intime, nulle autobiographie n'est plus satisfaisante "; Morley [10] a year later said flatly that the work " is no autobiography, but rather a garrulous disquisition upon himself, written by an old man when his mind was affected by much recent sorrow." Burr [11] in 1909 thought that the works of Cardan, Saint Augustine and Julius Caesar were " the

* Not *six* volumes, as Professor Thorndike has stated. See reference 64.

† It is said that this translation was republished in 1922 by the Cogliati firm in Milan, with a preface and notes by Lavinia Mazzucchetti, but the writer has not seen this edition.

** This translation was supplied to the author by Miss Jean Stoner, of Shaker Heights, Cleveland, Ohio. This volume is not easy to obtain; if it had not been for the generosity and solicitude of Miss Stoner the author probably would not have secured the book.

predominant influences upon all later manifestations of autobiographical writing," a view that was echoed by Dana [12] in 1921. Johnston,[13] writing in 1927, was less sanguine, allowing only that the *De Vita Propria Liber* was "a signal bit of self-study, full of good sense and free from the morbidity that later characterized so much of what might have been very charming autobiography."

Studies devoted to Cardan himself and his works are much more numerous. One of the earliest,[14] that of the fierce philologist and polemist, Julius Caesar Scaliger (1484-1558), was vituperative and ill conceived. Other early pieces on Cardan did not approach the ferocity of Scaliger's tract, but were frankly critical of the Milanese physician. Jacques-Auguste De Thou (1553-1617), *conseiller d'état* to both Henry III (1574-1589) and Henry IV (1589-1610) of France, saw Cardan in Rome during the last years of the old physician and philosopher. His account of Cardan in the *Historia Sui Temporis*,[15] which appeared between 1604 and 1608,* is most unfavorable.† Worse, it served to influence subsequent commentators on Cardan for many years.

Another early detractor of Cardan was Martin-Antoine del Rio (1551-1608), who was agitated by what he thought [16] was Cardan's atheism. Still another who attacked Cardan was the indefatigable bibliographer and librarian, Gabriel Naudé (1600-1653), through whose exceptional industry many of Cardan's manuscripts were collected and printed for the first time. Naudé's well-known judgment of Cardan, which is appended to all the Latin editions [17, 18, 19] of the *De Vita Propria Liber*, is decidedly critical. Curiously, in another work, the *Apologie pour les Grands Hommes soupçonnez de Magie*, Naudé was much less derogatory of Cardan than he had been in the aforementioned judgment.

Spizelio [21] in 1676 thought Cardan was a skeptic, but in his comment he actually did little more than to repeat the objections of Del Rio.[16] Teissier,[22] in contrast, was able in 1686 to mention some of Cardan's works without adverse remarks. Morhof [23] in 1688 ** was scarcely friendly to Cardan, but he did recognize the achievements of the Milanese. A champion of Cardan finally arose in the person of Bayle,[24] whose great encyclopaedia was issued between 1695 and 1697 and in 1702.‡ Bayle

* The writer used the edition of 1733, published in London by Samuel Buckley.

† It should be stated that De Thou was a friend of Joseph Justus Scaliger (1540-1609), son of Cardan's bitter enemy.

** The writer had access only to the edition of 1708, published at Lübeck by Peter Böckmann.

‡ The edition used in this study was the Amsterdam and Leyden version of 1730.

defended Cardan against several charges; his article is still referred to by those who seek testimony which will reflect credit on Cardan. But some of Bayle's defense was at least partially vitiated by De la Monnoye, in a disquisition on a legendary work of impiety known as *De Tribus Impostoribus*.* De la Monnoye in about 1712 composed a letter in which he listed a number of men who might have been the author of the heretical work. He did not say that Cardan was or could have been the author of the apocryphal tract, but declared that Cardan once had compared the four chief religions of his time, in the eleventh book of the first edition (1550) of his *De Subtilitate*: ". . . et après les avoir fait disputer l'une contre l'autre, sans qu'il se déclare pour aucune, il finit brusquement de cette sorte, *His igitur arbitrio victoriae relictis*; ce qui signifie qu'il laisse au hasard à décider de la victoire [25] . . . ." As a matter of fact, this was merely a restatement of one of the charges Scaliger had made against Cardan.

Teubner [26] in 1725 devoted an entire dissertation to what he called the superstitions of Cardan in the domain of natural science. Christius [27] in 1729 included a consideration of Cardan in *Noctium Academicarum*, basing much of his comment on the writings of Bayle on the same subject. Nicéron [28] in 1731 devoted a long section to Cardan in the fourteenth volume of his *Mémoires pour servir à l'histoire des hommes illustrés dans la république des lettres*, in which he was not particularly enthusiastic about Cardan, but in which he did recognize the superior endowments of the Milanese. Heister [29] in 1736 mentioned Cardan in his *Apologia Pro Medicis qua eorum depellitur cavillatio, etc.*, in which he took notice of the objections of Scaliger, Naudé, Spizelio and others.

A really important contribution to knowledge concerning Cardan was made by Brucker,[30] in his well-known history published between 1742 and 1744.† Brucker dealt with Cardan at great length. He said that Cardan, in *Claudii Ptolemaei Pelusiensis Libri Quatuor de Astrorum judiciis cum expositione Hieronymi Cardani*,** had attempted to cast the horoscope

* Dantier wrote in 1874: "On a prétendu que le livre *De Tribus Impostoribus*, attribué à Frédéric II, fut imprimé sans titre en 1598, en un petit volume de 48 pages in-8°. L'ouvrage fut réimprimé à Vienne en 1753; mais, comme l'ancienne édition n'a été vue par personne, qu'elle ne se retrouve nulle parte, elle pourrait bien n'être qu'une mystification typographique, et l'édition nouvelle qu'une spéculation de librairie. Quoi qu'il en soit, on a encore désigné comme auteurs présumés de ce livre Arnaud de Villeneuve, Boccace, le Pogge et Campanella." See: Dantier, Alphonse: *L'Italie. Études historiques.* Paris, Didier et Cie., Libraires-Éditeurs, 1874, vol. 1, p. 438 [footnote].

† The author used the second edition of this work, published at Leipzig in 1766 and 1767.

** In addition to Cardan's critical commentary on Ptolemy's treatise on the heavenly

of Jesus Christ.* This accusation, like that of De la Monnoye, mentioned earlier, was by no means new. On the other hand, Brucker's formidable chapter on Cardan contained much that was favorable to the Milanese. It certainly was the most complete essay on Cardan and his works that had appeared since the writings of Naudé.

Lessing's vindication [31] of Cardan was written in 1752. It was devoted wholly to a defense of Cardan against the charges made by Del Rio, Brucker, De la Monnoye and others. Lessing, saying frankly that his own piece should be considered an addition to Bayle's earlier defense of Cardan, remarked that Cardan actually was scrupulously fair to his own religion, but was unfair to the others: Judaism, Islamism and paganism. Another work which is remarkable, like that of Brucker, for its inclusiveness is Clement's catalogue [32] of rare and obscure works. This appeared only a few years after Lessing had written his defense of Cardan. The viewpoint, appropriately, is that of the bibliographer rather than the critic or moralist, although Clement did not neglect to incorporate the comments of others in his footnotes. His section on the various editions of works by Cardan is not complete, but it is still valuable.

It was the nineteenth century which was particularly replete with literature about Cardan, and some of it was of pretentious length. Goethe [33] saw fit to compare Cardan with Benvenuto Cellini † (1500-1571) in his account of the history of the theory of colors, first printed in 1810. Two other Germans [34] devoted a volume to an analysis of two of Cardan's tracts in 1820. In the same year an Englishman ** gave brief consideration [35] to

bodies, the volume contains twelve specimen genitures as cast by Cardan. The eighth geniture is his own. It occupies pages 430 through 475 of the work indicated by reference 317.

* Nicéron (reference 28) erred when he said that this horoscope is to be found only in the first (1554) and second (1555) editions of the volume indicated. The horoscope is plain to be seen in the fifth volume of Spon's edition of the *Opera Omnia* of Cardan. See reference 318.

† This comparison is a common one. It is perhaps to be expected that Goethe should make it, when it is recalled that Goethe had made a translation of Cellini's *Memoirs* from the Italian into the German. The manuscript by Cellini was found by the naturalist and physician, Francesco Redi (1621-1697), but was not printed until 1728, by Pietro Martello. Goethe was so entranced by the Italian version that he translated it into German.

** The article in question was not signed. It appeared in the *Retrospective Review* of London in 1820. Bellini in the bibliographic notes to his translation of *De Vita Propria Liber* (see reference 37) ascribed the paper to Henry Southern (1799-1853), who founded the *Retrospective Review* in 1820 and edited it until 1826. The real author of the paper, however, was not Southern, but James Crossley (1800-1883) of Manchester. Charles William Sutton's piece on Crossley in the British *Dictionary of National Biography*, vol. 5, pp. 228-230, clearly establishes the fact that Crossley was the author of the paper on Cardan referred to above.

Cardan in one of the British literary magazines.† Another Englishman [26] in 1854 produced a work which an Italian authority [27] on Cardan was pleased to call "lo studio più completo sulla vita e l'opera" of Cardan.

† Curiously, what seems to be an apocryphal biography of Cardan has made its way into many bibliographic lists. This is *The Life and Times of Jerome Cardan*, 2 volumes, 8vo., London, 1836, by James Crossley. The work is listed in such continental encyclopaedias as the *Enciclopedia universal ilustrada europeo-americana*, the *Nuova Enciclopedia italiana, ovvero dizionario generale di scienze, lettere, industrie, ecc.*, the *Dictionnaire général de biographie et d'histoire, de mythologie, de géographie ancienne et moderne comparée, des antiquités et des institutions grecques, romaines, françaises et étrangères*, in Hoefer's well-known *Nouvelle biographie générale, etc.*, and even in the bibliographic sections of the translations of Cardan's *De Vita Propria Liber* by Bellini (reference 37), Stoner (reference 6), Hefele (reference 5) and Dayre (reference 8). Nevertheless, the writer is convinced that this book does not exist, at least in printed form. It is not owned by the New York Public Library, the Library of Congress, the Army Medical Library, the Harvard College Library, the Columbia University Libraries, and other large libraries in the United States. James Crossley (1800-1883), to whom this work is attributed, was a native of Manchester, England. The Manchester Public Libraries, to which Crossley gave many of his books, own much of his correspondence, but never have heard of the book on Cardan attributed to Crossley. On June 1, 1944, Mr. Charles Nowell, M. A., F. L. A., chief librarian of the Manchester Public Libraries, reported to the writer: "I have had a search made in the Crossley correspondence which is here. An autograph letter from Robert Southey seems to indicate that Crossley was collecting information for a proposed biography of Cardan. Southey wrote 'I should have been very glad if I could have given you any of the information of which you are in search; but unfortunately there is not one of your questions that I can answer. I have read none of Cardan's works, except his own life, and have paid no particular attention to what I may have met with concerning him or other writers. But seeing that he was a most remarkable person I have often thought that a full account of his life and opinions would form a very interesting book. You will have much pleasure in pursuing so curious a subject. Wishing the public in general may be as desirous of seeing the result of your labours as I certainly shall be . . . .' This was written from Keswick 9 November 1832 long before Morley's 'Life' appeared." This letter from Southey, hitherto unpublished, so far as the writer is aware, surely suggests that in 1832 Crossley was engaged in collecting data for a biography of Cardan. Mr. Robert H. Haynes, assistant librarian of the Harvard College Library, has contributed additional information to the problem. In a letter of February 15, 1944, to the author, he wrote: ". . . in a sales catalogue of Sotheby, Wilkinson & Hodge, entitled 'Catalogue of The Second Portion of the Library of Rare Books and Important Manuscripts, of the [late] James Crossley, Esq. F. S. A.,' 1885, entry 2939 reads as follows:

> CARDANO (GIROLAMO) Life of this noted Author, in the autograph of Mr. Crossley, 135 large folio pages, collected and compiled from various sources, a valuable MS."

This entry in the Sotheby catalogue dated 1885 would agree with Charles William Sutton's piece on Crossley in volume 5 of the *British Dictionary of National Biography*, wherein he stated that part of Crossley's library was sold by Sotheby in July 1884 and part in June 1885. On October 13, 1944, Mr. Charles Nowell, of the Manchester Public Libraries, was able to advise the writer: "It [the manuscript by James Crossley] was sold for the sum of £1. 15s. Od. to Bernard Quaritch Ltd., 11 Grafton Street, New Bond Street, London, W. 1."

In the same year Cardan was accorded some notice in another popular British magazine, the famous *Blackwood's Edinburgh Magazine*.[38] Lombroso,[39] who actually considered Cardan to be one of his predecessors, in 1855 examined what he called the *pazzia* of Cardan, an aspect which he was to consider again in his well-known *Genio e follia*.[40] In 1858 Cardan was given notice in another popular journal, this time the *Revue britannique*.[41] Waters' competent study [42] of Cardan was published in 1898;* Cumston [43] contributed a short piece on Cardan in 1902. Vidari's study [44] of 1904, which he cautioned was only a "Conferenza, non studio completo quale il vasto argomento richiederebbe," was followed by Costa's piece [45] of 1905 on Cardan at the University of Bologna. Rivari's work [46] of 1906 extended the type of inquiry begun by Lombroso.[39, 40] Kümmel,[47] writing in 1910 on Cardan and his relationship to certain aspects of dentistry, reached no more significant a conclusion than: "Wer weiss, was bei ihm grösser war: Der Schalk oder des Weise, der Narr oder der Ironiker?" Lawrence's short commentary [48] on Cardan of the same year was both inaccurate and unsatisfactory. In 1912 Bianchi [49] produced a valuable inquiry into the relationship between Cardan and the College of Physicians of Milan; in 1915 Soriga [50] published his article on the wills which Cardan made during his last three years in Pavia. Laufer's interesting study [51] of the so-called Cardan suspension or shaft appeared in 1916. A year later Burr [52] presented a short and restrained inquiry after the manner of the studies of Lombroso [39, 40] and Rivari.[46] The essays of Dana [12] and Ruhräh [53] on Cardan were printed in 1921. Capparoni's article [54] on Cardan probably was issued in 1926.† Dayre ** published a valuable biographic study of Cardan in 1927. Auden [55] in 1929 offered a paper on Cardan from the viewpoint of a psychiatrist; in the same year Bilancioni [56] published his comparison of Cardan with Leonardo da Vinci. Tanfani [57] in 1931 approached the life and career of Cardan from the standpoint of eugenics. A year later Major [58] included a chapter from Cardan's first book in his *Classic Descriptions of Disease*, and in 1933

* Waters in 1919 included Cardan in a piece called "Pioneers in Humanism." But this piece was only a *feuilleton*, and added nothing to the literature on Cardan. See: Waters, W. G.: Pioneers in Humanism. *Anglo-Italian Review* 3: 242-253 (March); 311-318 (April) 1919.

† It is difficult to fix the year in which this paper was printed. See the note appended to reference 54.

** The study by Dayre was encountered too late for it to be included in the list of references at the end of the present work. The complete reference is: Dayre, Jean: Jérôme Cardan (1501-1576). Esquisse biographique. *Annales de l'Université de Grenoble* [section lettres-droit] 4 (new series): 245-355, 1927.

Friedenwald [59] contributed a provocative essay on Cardan's horoscope of Vesalius to an Italian journal. The translation by Cass [60] of the first book of *De Subtilitate* constituted a doctor's thesis of 1934. In the next year Castiglioni [61] wrote about both Cardan and Vesalius, Cunha [62] dealt with Cardan alone, and Gumpert [63] included Cardan in his *Das Leben für die Idee*,* which was issued in an English translation in 1936. One of the latest evaluations of Cardan is that of Professor Thorndike,[64] published in 1941.

Yet all this mass of literature concerning Cardan, by no means complete as cited herein, does not include references to the writings of the more than seventy men by whom he was mentioned during his own lifetime, as identified by Cardan himself in the forty-eighth chapter [65] of *De Vita Propria Liber*—ample evidence that his works "were read fairly extensively and that they exerted considerable influence." [64]

Moreover, the abundance of works by Cardan which were published during his own lifetime is impressive.† The investigator who counts himself fortunate indeed if he can obtain one book by a man of the sixteenth century, printed during the lifetime of that man, would be delighted with the coeval productions of Cardan. His first book [66] was printed at Venice ** when he was but thirty-five years old; it was a volume on the bad practice of medicine as Cardan viewed it, and he wrote it in fifteen days.[67] At least five editions of *De Subtilitate* were printed between 1550 and 1554, and three editions of the supplementary work, *De*

* The writer has not seen the German edition.

† This statement should be qualified: there is some reason to believe that Cardan had to pay for the printing of at least some of his books. On the other hand, it was Cardan's *Practica Arithmetica*, published in 1539, which brought the name of Cardan to the attention of Andreas Osiander (1498-1552), editor for the Nuremberg printer, Johannes Petreius. Six years later, Petreius brought out Cardan's *Ars Magna* at Nuremberg. The book was edited by Osiander. See reference 71.

** According to Dayre, Cardan in 1534 wrote and had printed at his own expense "*De Astrorum judiciis*, curieux mélange d'astronomie et d'astrologie: ses connaissances sur les mouvements des astres exposées en premier lieu sont appliquées à la prévision des événements humains." But in a footnote, Dayre wrote of this book: "Il ne faut pas le confondre avec le *Commentaire au De Astrorum Judiciis de Ptolémée* [reference 317] qui parait en 1554. De cette édition à frais d'auteur nous n'avons pu retrouver trace. Aucune bibliographie ne la cite. D'après Naudé, c'est le même ouvrage qui aurait été réédité à Nuremberg en 1543, sous le titre: *Libelli duo, unus de supplemento almanach, alter de restitutione temporum.*" The present writer was not able to find this volume of 1534, and hence, like most other commentators, has accepted the *De Malo Recentiorum Medicorum Medendi Usu Libellus* [reference 66] of 1536 as being Cardan's first printed book. See: Dayre, Jean: Jérôme Cardan (1501-1576). Esquisse biographique. *Annales de l'Université de Grenoble* [section lettres-droit] 4 (new series): 245-355, 1927.

Rerum Varietate, appeared in 1557 and 1558.[64] While Cardan was still alive, printers in Paris,[68] Lyons,[69] Avignon,[70] Nuremberg,[71] Basel,[72] Rome,[73] London,[74] Antwerp [75] and Cologne * were turning out his writings, a fact which supports Crossley's assertion [85] that "The literary labours of Cardan, though now obsolete, and very rarely consulted by any but the industrious historian of learning, were, in their time, the foundation of a very high and well deserved reputation." The *Opera Omnia* were not, it is true, printed during the lifetime of Cardan,† but the enormous amount of material contained in them nevertheless attests to the industry of the Milanese physician. Respect for the labors of Cardan is heightened when it is considered that the *Opera Omnia* do not represent everything he ever wrote.**

How, then, in the face of such a weighty accretion of material about Cardan and his works, can there be justification for still another study of the man?

The answer was suggested, in part, by a sentence which the late Preserved Smith [76] wrote in 1930: ". . . suddenly, within two years, appeared three of the most momentous works of science that the world has ever seen, Copernicus *On the Revolution of the Heavenly Orbs* (1543), Vesalius *On the Structure of the Human Body* (1543), and Cardan's *The Great Art* (a treatise on algebra, 1545)."

It is a curious fact that two of the men mentioned by Professor Smith have been remembered most handsomely by posterity, whereas the third has been almost wholly forgotten. For one thing, the career of Vesalius has been recounted so often that, like the "Albertine literature" con-

* The work printed at Cologne was not an entire book by Cardan; it was an excerpt from the sixteenth book of *De Subtilitate*, inserted in a small volume by Johann Spangenberg (1484-1550) that was printed in 1563. The excerpt by Cardan is entitled: "De Arte Canendi ex libro decimsexto de Subtilitate Hieronymi Cardani Mediolanensis." The book is said to be extremely rare. A copy of it is owned by the Library of Congress. It consists of thirty-one unnumbered leaves; the excerpt by Cardan occupies the reverse of leaf 29 and the obverse of leaf 30. The complete reference is: *Quaestiones Musicae in Usum Scholae Northusianae, per Ionnem Spang. Hordess. collectae.* Cologne, Peter Horst, 1563.

† Dana (reference 12) made the egregious error of writing that Cardan's *Opera Omnia* "appeared ten years before his death, 1563." The statement is doubly wrong: the *Opera Omnia* were printed in 1663, and Cardan died in 1576.

** Cardan himself seems to have destroyed many of his writings. In the forty-fifth chapter of *De Vita Propria Liber* he wrote: "Bis autem magnam copiam, ac numerum eorum perdidi: primum circa xxxvii. annum, cùm circiter ix. libros exussi, quòd vanos, ac nullius utilitatis futuros esse intelligerem. . . . Anno autem M. D. LXXIII. alios cxx. libros, cùm iam calamitas illa cessasset cremavi, sed non ut in prima: verum decerpsi quicquid utile mihi esse visum est . . . ."

cerning the Dominican, Albert von Bollstädt (1193-1280), we now have what might almost be called a "Vesalian literature." Much work on the life and activities of Vesalius was printed in 1943, on the occasion of the quatercentenary of the publication of the *De Fabrica Humana*. Similarly, Copernicus was the subject of at least two works [77, 78] printed in 1943, on the occasion of the quatercentenary of the publication of his *De Revolutionibus Orbium Coelestium*.

Jerome Cardan, on the other hand, actually is becoming less well known with the passing of the years. As much is known of his life as is known of the life of his mercurial contemporary, Benvenuto Cellini (1500-1571), yet Cellini's name has far outshone that of Cardan. Cellini's autobiography existed only in manuscript form until 1728, whereas Cardan's *De Vita Propria Liber* was printed as early as 1643.[1] Yet, although the man who steps into an automobile to visit a gallery wherein a certain silver salt cellar is displayed knows that the name of Cellini has attracted him there, he probably does not know that the name of Cardan is perpetuated in the joint of the automobile that is swiftly and smoothly transporting him. Neither does the toiling schoolboy, who can identify Cellini's *Perseus holding Aloft the Head of Medusa* but cannot solve his cubic equations, realize that it is Cardan whom he should curse for his pains. The anatomist who reveres the name of Vesalius may know little or nothing about Cardan, for Cardan made no important contributions to anatomy. The astronomer or physicist thoroughly acquainted with the achievements of Copernicus might reflect only that Jerome Cardan was in some way associated with cubic equations which he did not invent.*

The year 1945 marked the quatercentenary of the publication of Cardan's *Ars Magna*.[71] During that year Cardan was in no wise accorded the tributes paid to Vesalius and Copernicus in 1943. Yet no man was more avid of fame than the Milanese physician. He devoted an entire chapter [79] of *De Vita Propria Liber* to "Cogitatio de nomine perpetuando," and expressions of anxiety concerning the posthumous condition of his reputation are common enough in his writings. In the frontispiece of *De Subtilitate* in the edition of 1560 he wrote:

> Non me terra teget, coelo sed raptus in alto
> Illustris vivam docta per ora virûm:
> Quicquid venturis spectabit Phoebus in annis,
> Cardanos noscet, nomen & usque meum.

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* Cardan did not invent cubic equations. On the other hand, Professor Miller (reference 258) recently said that Niccolò Tartaglia (1505-1557), usually credited with the

To appraise such a man, who assuredly contributed so much to the advancement of learning, and who nevertheless in modern times seems to be almost bereft of the fame he so greatly desired, is an undertaking which appears not to be wholly without profit.

discovery, could not have devised the equations or their solution. This point will be discussed further in the fourth chapter of this work.

II.

PAUCA DE VITA EIUS

The history of science or the history of medicine is but one aspect of the history of civilization. Neither the history of science nor the history of medicine possesses substance and sinews which will permit it to stand sufficient unto itself. The figure of the physician, as such, cannot be explained without some inquiry into the needs within the social fabric which operated to bring him forth; similarly, the emergence of the scientist in any field of endeavor cannot be fully understood without examination of his relationship to the vast concourse of human affairs, and in turn, the effect of those affairs upon his life and career. Happily, the time is long departed when history in any valid sense could be explained or justified on the sterile basis of chronology and the setting down of factual events. To say that Charlemagne was a king of the Franks who was born in 742, became great, and died in 814 signifies chiefly nothing, as Henri Pirenne [80] has so brilliantly shown. To say that Jerome Cardan was a physician and philosopher who lived through most of the sixteenth century, and to suggest that his life and works can be explained on the basis of sixteenth-century medicine and philosophy alone, would indicate an approach and treatment so barren and superficial that the resultant study would not be worth setting down on paper.

Scarcely anything Jerome Cardan did or wrote can be understood without some knowledge, at least, of his environment and his reactions to it. Nor can the clash of stubborn Habsburg arms against Valois power in the north of Italy fail to affect the destinies of those who, like Cardan, had no part whatever in the sanguine struggle. Moreover, the stolid refusal of a man like Cardan to acknowledge an English monarch as *Fidei Defensor* contrasted with his subsequent dedication of one of his most important works * to the same sovereign, demands something more than ecclesiastical history alone can supply, if the motives behind either action are to be uncovered. So far as they can be determined, Cardan's position in the society in which he lived, his relations with persons within that

* The monarch was the sickly Tudor youth, Edward VI (1537-1553), and Cardan's book was *De Rerum Varietate*, which is included in volume 3 of the *Opera Omnia*. Cardan's highly inaccurate horoscope of King Edward VI occupies pages 403-413 of the work indicated by reference 317.

society, and the impingement of social factors upon his own life and work, are what are needed.

Oddly, no one has ever been certain as to when Cardan was born. His own testimony on this question is confusing. In the second chapter [81] of the *De Vita Propria Liber*, for instance, he wrote that he had been born in 1500. In the third book [82] of *De Consolatione*, in the third book [83] of *De Utilitate Ex Adversis Capienda*, and in the *Liber Duodecim Geniturarum* [84] he said that he had been born in 1501. Bayle [24] accepted 1501 as the correct year of the birth of Cardan, without, according to Morley,[85] having read more than one of Cardan's works. Haeser [86] seemed to believe that Cardan was born in 1505; Dana [12] for some reason said that Cardan in 1552 was fifty years old. Bertolotti,[87] after calculation based upon what Cardan wrote in one of his several wills, decided that Cardan was born in 1506.* Gumpert [63] thought that Cardan was born in 1500. On the basis of internal evidence in the works of Cardan and also on the results of investigations by various scholars,[9, 43, 44, 52, 53, 55, 58, 64, 88, 89, 90, 91] it would appear that Cardan was born in the year 1501, and that he was born on September 24. So far as this writer is aware, no one has doubted that he was born in Pavia.

Cardan thus was born during the reign of Maximilian I (1459-1519) of Habsburg as Holy Roman Emperor, and during the pontificate of the Borgian, Alexander VI (1431-1503). Bryce [92] has called it an era in which the Empire was becoming slowly merged into that of the Germans, a time when " Here, indeed, the history of the Holy Empire might close, did not the title unchanged beckon us on, and were it not that the events of those later centuries may in their causes be traced back to times when the name of Roman was not wholly a mockery." [92]

So far as the personal fortunes of Cardan were concerned, affairs within the Empire in this age were momentous. Cardan was reared in the duchy of Milan, which during most of his life was aflame with either personal intrigue or actual strife of the most sanguine nature. He himself recorded the fact that the warfare which beset Milan during his early years exerted important influences on his life. When Cardan was nineteen years old King Charles I (1500-1558) of Spain was crowned Holy Roman Emperor at Aachen. The contests of that monarch with France were to affect the career of Cardan profoundly when northern Italy became the hapless

* Cardan made a will on January 15, 1566, in which he said he was sixty years old. Bertolotti reasoned thus: " Se nel 1566, il Cardano contava 60 anni[,] era nato nel 1506." Miss Jean Stoner who translated the *De Vita Propria Liber* into English in 1930 (reference 6), kindly lent the writer a photographic copy of this will of 1566.

theater of the fierce tournament * for supremacy between Charles and the French.

It seems likely that Cardan was illegitimate: the natural son of Fazio Cardan (1445-1524) and Clara Micheria or de Micheriis (1467-1537). Bellini [93] wrote: " Colà [the village of Moirago] il bambino rimase fino al quarto anno di età, perchè Fazio non voleva si sapesse pubblicamente, che egli aveva una concubina con un bastardo . . . ." Of Cardan's birth Tiraboschi [91] wrote: ". . . [it was not] ancor ben certo s'ei nascesse di legittimo matrimonio," but Sardou [96] was more emphatic: " Il était fils naturel de Facio Cardan et de sa concubine Claire Micheria." Bayle's conclusion [24] was: " Comme sa mère n'étoit point mariée, elle fit tout ce qu'elle put pendant sa grossesse pour perdre son fruit . . . ." Michéa [9] said flatly that Clara Micheria was a " concubine † qui avait l'habitude de prendre des breuvages pour se débarrasser des produits de son commerce illégitime." There is no doubt that Fazio Cardan was the father of Cardan; but Cardan [95] himself wrote that his father openly spoke of him as a bastard.** The question is more important than it would seem to be, for it had disastrous effects upon Cardan's first venture into the practice of medicine at Milan after he had obtained his doctorate. It seems certain, similarly, that Cardan was an undesired child, for in addition to the testimony above, there is his own statement [88] on the point: ". . . mater, ut abortiret, medicamentum abortivum, dum in utero essem, alieno mandato bibit . . . ." For some time after the birth of the infant it was feared that he would not survive.[81]

Fazio Cardan, father of Jerome, was a learned man; a jurisconsult. He may even have been a doctor of medicine at some time: " Pater meus Facius Cardanus Medicus primo, inde Jurisconsultus factus est." [96] Jerome thought he could trace his ancestry back to a personage called Milane de Cardano, who was archbishop of Milan from 1187 until his death on

* Warfare at this time was particularly brutal. Ambroïse Paré (1510-1590), who served as a military surgeon with the French forces, has written about some of the fearful injuries sustained by soldiers of both factions, in the story of his life and journeys. See: Packard, F. R.: Ambroïse Paré. In: *Lectures on the History of Medicine: A Series of Lectures at the Mayo Foundation and the Universities of Minnesota, Wisconsin, Iowa, Northwestern, and the Des Moines Academy of Medicine.* Philadelphia, the W. B. Saunders Co., 1933, pp. 229-252.

† Bayle (reference 24) would allow this word, but not the more opprobrious epithet, " putain."

** Bellini (reference 93) contended that Fazio, about two months before he died in 1524, married Clara Micheria so that Jerome would be legitimized thereby. This point will be considered herein, *infra.*

August 16, 1195, a man of whom Bellini [97] said: "Era certemente di famiglia nobile, perchè apparteneva agli Ordinarii della Metropolitani in Milano: fu uomo tenace e battagliero, ma generoso." Cardan also wrote [98] that he might have been descended from Francesco Cardano, leader of troops for Matteo Visconti (1250-1322); or that, if his family was in truth a branch of the Castiglioni,* he was related to Godfredo Castiglione of Milan, who succeeded the great Pope Gregory IX in 1241 as Pope Celestine IV, and was pontiff for fifteen days. As Cardan recounted it,[98] all his forebears had been unusually longevous.†

The boy's life was exceptionally hard. His father, although he probably was less unkind than the mother, was choleric and harsh. It has been intimated [9] that he was insane. The mother was cruel to the boy. Cardan never reproached her, when later in life he wrote about her; but on the other hand, he never accorded her the affection he manifested toward his father. The boy was beaten unmercifully, often without discernible cause. When Cardan was seven years old, it was decided that he should be whipped no more.[99] At the same time, however, his father forced him to accompany him on his rounds about the city, as a sort of *famulus*, to carry his bag. When he was about eight years Cardan fell ill of dysentery; before he had entirely recovered he fell down a flight of stairs and cut open his head; before he was well again a stone hurtled down from the top of a house and injured his head a second time.[99] His father then delivered him from the duties of *famulus*, but at the age of ten years the boy had to

* Curiously, Cardan (reference 98) implied that "certain people" thought the Cardans were descendants of the Castiglioni. But there is evidence that Cardan himself once thought so: he included this surname with his name on the title of his first printed book, published in 1536 (reference 66). Speaking of this particular book, Clement (reference 32) wrote: "Si l'on n'étoit pas sur ses gardes, on pourroit s'imaginer facilement, que ce Livre n'est pas de nôtre *Cardan*; mais de *Girolamo Cardano Castiglione* . . . ." Clement's explanation of this action on the part of Cardan was this: "Il y a aparence que *Jerôme Cardan* avoit dessein d'illustrer son nom à la tête de ses premiers Ouvrages, en y aioutant celui de *Castellioneus*, pour faire voir qu'il étoit issu d'une famille noble, qui portoit ce nom. . . . . *Cardan* pensoit autrement vers l'an 1560, où il écrivoit ceci [his reply to Scaliger's attack in which the question of families arose], qu'en 1536, où il commençoit à devenir Auteur. Alors il avoit besoin des Titres de ses Ancétres pour lui donner du relief; mais vintquatre [*sic*] ans après, il n'avoit plus besoin que de son nom, pour recommander ses Ouvrages."

† Bellini (reference 93) in 1932 said, ironically enough, that there was no trace of the descendants of Jerome Cardan. In Milan in the seventeenth century, he declared, one Gerolamo Cardano was a physician. "Anche tuttora si hanno molte famiglie Cardano in Lombardia, specie nell'alto Milanese; ma non c'è alcun motivo per crederle discendenti dal Nostro, poichè si tratta di uno di quei cognomi toponomastici, che sono frequentissimi nelle nostre plaghe."

resume the work. Often, as he trudged about Milan with his father, Cardan's ears were assailed by unlovely epithets hurled at the name of his mother [95]—actions which tend to suggest that Fazio had not married Clara Micheria.

Cardan seems not to have lacked the ordinary comforts of life as a boy. His father apparently enjoyed a fairly substantial income. The boy's preliminary training was sound, but not impressive. It was provided by his father, but only at odd moments. The elder Cardan, determined that his son should be schooled in jurisprudence so that he might succeed to a stipend of 100 crowns a year which the father received from a lectureship in law,[100] taught Jerome what he thought were the requisite fundamentals of geometry, arithmetic and astrology.[88] The boy had some instruction in music, and his father had him trained in dialectics. Cardan much later said [101] that in his youth he had lacked a knowledge of Latin, and it would appear that he did not begin to study it seriously until he was past the age of nineteen years. There is no justification, however, for the statement of Thorndike [64] that Cardan knew Latin, but not Greek. It is known that Cardan could read Greek rather easily, and that he could write it only a little less easily.[102] In *De Sapientia* and *De Consolatione*, for instance, Cardan quoted Greek in various places (*passim*), and he nearly always provided Latinized versions of the phrases he reproduced from the Greek. It is true, however, that he did not begin to study Greek until he was about thirty-five years old, and that he did not set about in earnest to learn the language until he was about forty.[102] Of his mastery of Italian there is no doubt. Libri [103] thought that two of Cardan's pieces in Italian, "Se la qualità può trapassare di subietto in subietto" [104] and "Discorso del vacuo," [105] would assure the Milanese first rank among Italian writers in the vernacular.*

Not much more than the foregoing is known about the early training of Cardan. On the basis of Cardan's own testimony, however, it may be judged that he had rather be sequestered with his studies than venture abroad in the city of Milan, for there is nothing to suggest that as a boy he had intimate companions with whom he could spend his idle hours. Actually, the contrary seems to be true. The record of Cardan at both

*Cass (*The First Book of Jerome Cardan's De Subtilitate*, Williamsport, Pa., the Bayard Press, 1934, p. 23) apparently thought that another treatise, called "Operatione," was another of Cardan's Italian pieces. This piece indubitably appears in the tenth volume of the *Opera Omnia*, where it occupies pages 602 through 620. But it could hardly have been written by Cardan, since, as Libri (reference 103) has pointed out, the name of Galileo Galilei (1564-1642) appears in the piece several times. Galileo was twelve years old when Cardan died in 1576.

Pavia and Padua indicates that his early schooling must have been sound. It is true that he had a superior mind, but the ease with which his successes in the university came to him implies early intellectual discipline and considerable industry. It is likely that Fazio Cardan was the sort of man who could instill these qualities.

There is some doubt as to the year in which Cardan entered the University of Pavia. In *De Utilitate* [83] he wrote that he was twenty-one years old when he became a student at Pavia; in *De Vita Propria Liber* [99] he wrote: "Anno exacto XIX contuli me in Ticinensem Academiam." In view of what is known generally of the age of university students of the time, the latter statement seems the more credible. If it be accepted, then Cardan entered the University of Pavia in 1520, the year in which Charles I of Spain was crowned Holy Roman Emperor. Until the end of his twenty-first year he spent all his time between Pavia and his home in Milan. His career at Pavia was uniformly felicitous. In addition to studying, he was able to debate in public and to give instruction in Euclid, dialectics and elementary philosophy.[99] In Cardan's twenty-second year Milan was convulsed by the refusal of Francis I (1494-1547) of France to relinquish his rights to the duchy of Milan, given to France in 1505 by the Emperor Maximilian I (1459-1519).[106] Francis invaded northern Italy in 1524, and would have struck at Milan itself had he not discovered that in the previous year the pest had visited the city, causing thousands of deaths. Fearing a resurgence of the dread disease, Francis went instead to Pavia, which he besieged. There he was captured by the defending Spanish forces on February 25, 1525, at the Battle of Pavia, which Kraus [107] called "the greatest military event of the sixteenth century." The University of Pavia was closed as a result of this strife, just as the University of Padua had been closed in 1509 as a result of the War of the League of Cambrai.[108]

The Battle of Pavia usually is considered as being the salient aspect of a bitter struggle for dominance in northern Italy between Francis I and Charles V. But the event was also a prime influence on the career of Cardan, for after the University of Pavia had closed he went to the University of Padua. There, in the summer of 1524, he received what seems to correspond to the modern degree of bachelor of arts.[99] Toward the end of his twenty-fourth year Cardan, after two ballotings, was elected rector of the *universitas artistarum*.[99, 109] It is curious that Auden,[55] in an otherwise excellent study, made it appear that Cardan was elected rector of the University of Pavia, whereas Cunha [62] correctly stated that Cardan

had entered the University of Padua, but did not mention the fact that he had previously attended the University of Pavia.

The election of Cardan to the post of rector at Padua has occasioned much speculation. Stoner [110] said that from 1515 to 1526 no rectorships were recorded at Padua, and that in 1526 only a prorector was appointed. Waters [111] observed that ". . . Padua must have fallen considerably in its fortunes when it installed as its Rector an obscure student, only twenty-four years of age, and of illegitimate birth, and conferred upon him the right to go clad in purple and gold, and to claim, as his retiring gift, the degree of Doctor and the cross of Saint Mark." Mantovani [112] interpreted the post thus: " Il Rettore della Università era scelto a que' tempi fra gli studenti, e ne rappresentava in certo maniera il Decano." Bellini [113] accepted this view.

Actually, there should be no confusion at the election of a student to such a position in the sixteenth century, for Rashdall, Powicke and Emden [114] have shown that such was a common procedure at the University of Padua as well as at other universities of the time. A rector usually was a *clericatus* or ecclesiastical student; but it would have been possible for a student to be a *clericatus* even without being in minor orders. There is no record, it is true, that Cardan ever was a *clericatus*, although he once joined the mendicant Franciscans in pretended piety to alleviate the wrath of his father after some dispute.[88]

According to the *Statuta Universitatis Juristarum Patavini Gymnasii* [114] of 1550, the newly elected rector was invested with the rectorial hood in the cathedral, and was then escorted to his house by all the students, for whom he had to hold a banquet or at least provide wines and spice. Moreover, he was supposed to furnish 200 spears and 200 pairs of gloves for the combatants in a tournament held to celebrate his election. The statutes of the arts college at Padua in 1486, for instance, required the newly chosen rector to supply a *collatio* for the entire university, 800 spears for the tournament, and prizes to be awarded by himself and the *doctores legentes*. " In the sixteenth century the difficulty of obtaining candidates able to perform such expensive duties, together with the growing hostility of governments to student-rectorships, led either to a great reduction in the splendour and dignity of the office, or to its permanent discharge by deputies [114] . . ."

Hence, a rectorship was not an office which a poor student like Cardan could well support, even though the importance of the post may have declined greatly. Cardan himself never ceased to lament his folly in

accepting the rectorship; in *De Utilitate* [88] he wrote: "Stultè verò & id egi, quod Rector Gymnasij Patavini effectus sum tum, cum, inops essem, & in patria maximè bella vigerent & tributa intolerabilia. Matris tamen solicitudine effectum est, ut pondus impensarum, quamvis aegrè, sustinuerim." It may well be, as has been suggested,[115] that "During his life at Padua it would seem that Cardan, over and above the allowance made to him by his mother, had no other sources of income than the gaming-table." The fourth chapter [99] of *De Vita Propria Liber* strengthens such a suggestion.

In 1526 Cardan was graduated from the University of Padua as a physician, but only after three ballotings had been held. On the first only nine votes were cast in his favor; a second canvass did not help matters much; on the third, forty-seven votes were cast in his favor to only nine against him.[99] On the advice of Francesco Bonafede, Cardan, after his graduation, settled in Sacco (or Saccolongo), about twelve miles from Padua. There he began to practice medicine.* In 1529 Cardan went to Milan. It is this action which in comparatively recent times has stimulated additional investigation into the circumstances of his birth, as is indicated *infra*.

In about 1912 Bianchi [49] discovered some material in the library of the University of Pavia which concerned, among other things, Cardan's relations with the College of Physicians of Milan. When Cardan came to Milan from Sacco, he applied for admittance to this organization. "Ad ottenerla, egli [Cardan] dovette sostenere un lungo processo, che durò dal 1530 al 1539. È risaputo che uno dei requisiti necessari per entrare nei collegi milanesi era la nascita da legittimo matrimonio." [49] † The record shows that on December 30, 1530, Cardan asked that he be permitted to explain some of his desires to the College of Physicians, meaning that he sought entrance. Apparently, he deposited with the college some documents which he thought would prove his fitness as a candidate. On January 26, 1531, these documents were given to a jurisconsult, who was to examine them and report his findings to the college. The reply of the

* "Er behielt jedoch sein Amt zu Padua, welches er viel klüger gar nicht hätte annehmen sollen, nicht über ein Jahr, und begab sich zu Anfang des Jahres 1526 auf Anrathen und durch die Unterstützung des Arztes Francesco Buona-fede nach Sacco, und übte hier 6 Jahre hindurch die Arzneikunde aus." See reference 267.

† This particular requirement should occasion no surprise, for it was a condition of prime importance to a man's eminence in a guild, for instance, long before the sixteenth century. Before a man could become a *master* in a guild he had to prove, among other things, that he was of legitimate birth. See: Pirenne, Henri: *Economic and Social History of Medieval Europe*. New York, Harcourt, Brace and Co., 1937, p. 187.

jurisconsult on February 22, 1531, was favorable to Cardan: "posse Hieronimum Cardanum ad probationem prime partis, quam ipse probaturus professus est de profitetur, admitti. Videlicet, quod natus est de legitimo matrimonio e Domina Clara de Micheriis muliere nobilli quam pro uxore in ehius domo ehius pater tenebat, vocabat et habebat, et hoc tam tempore conzeptionis [*sic*] et nativitatis dicti Hyeronimi, quam etiam ante." [49]

But when the rector of the College of Physicians directed that all the members present swear that they knew of nothing which would controvert the findings of the jurisconsult, some confessed that they knew he was a *noto*, or bastard. The entire question was then referred to a second consultant, who completely overturned the findings of the first. The College of Physicians was advised by this man that Fazio Cardan had not been married to Clara Micheria until 1524, the year of his own death; and that after the marriage Clara had exclaimed: "Tandem hodie dn̄us Fazius accepit me in suam uxorem." [49] The ultimate result was that Cardan was not admitted to membership in the college at this time.

This incident is more important than a mere recital of facts because it brings contemporary sources into a question that has been argued interminably: whether or not Cardan was of legitimate birth. If it is true that Fazio Cardan was not married to Clara Micheria until 1524, then Jerome Cardan at birth plainly was illegitimate. Bellini [93] apparently accepted the belief of the College of Physicians: "Fu in quell'anno [1524] che il vecchio Fazio, forse nell'intento di legittimare il figlio Gerolamo, si decise finalmente a sposare la Micheria; e pochi mesi dopo l'avvenuto matrimonio, moriva." Since the College of Physicians was in possession of this information, yet did not admit Cardan to membership, the inference must be that the college did not believe that Fazio's marriage to Clara Micheria in 1524 legitimized Jerome Cardan.

Cardan soon went back to Sacco. There, at the age of about thirty-one years, he was married to Lucia Banderini (1516-1546) of that town. She was not much more than fifteen years old when he married her. He took her without a dower. Shortly, Cardan and his wife moved to Milan, but life there was intolerable. He was poor, and there seemed to be no prospect of improving his wretched fortunes by the practice of medicine without benefit of the acquiescence of the powerful College of Physicians. In April of 1533 Cardan and his young wife left Milan to go to Gallarate, where on May 14, 1534, his first son, Giambattista Cardan (1534-1560), was born.

Some slight surcease from the evils which beset him came to Cardan in November of 1534, through the intercession of Filippo Archinto (1500-1558), who had represented Duke Francesco Maria Sforza II (1492-1535) at the coronation of the Emperor Charles V in Aachen in 1520, and who later became an important churchman in Milan. Cardan had done some hack literary work for Archinto in Gallarate, and the two men had become good friends. Archinto contrived to have Cardan and his wife come to Milan and live in the Xenodochium, a place which at that time resembled a modern workhouse. Next, Archinto saw to it that Cardan was appointed lecturer on geometry and astronomy in a free school of the city. An infinitesimal salary was paid to the physician out of funds left to this school by a Milanese named Tommaso Piatti (?-1502).*† It would seem that Cardan was able, also, to practice medicine to some extent, for he became physician to the Augustinian friars in Milan. He later said [116] that he had managed to cure the prior of leprosy, after six months of treatment.** Archinto gradually introduced Cardan to influential Milanese; Cardan could, in this manner, treat those who came to know him and would seek him out for professional care. But he still did not enjoy the valuable support and assistance which membership in the College of Physicians would have conferred.

This situation was to be changed in the month of June, 1535. The records uncovered by Bianchi [49] show that members of the college assembled on June 6 of that year, at the petition of Cardan himself. His plea for admittance was reconsidered. Contrary to what has been written by careless commentators on the relations of Cardan with members of this college, the evidence indicates that the members actually were anxious to help him. All that was needed, apparently, was some exception to the rigid regulations pertaining to a candidate's birth. " E il cavillo fu trovato. Poichè il Cardano non poteva divenire membro effettivo del collegio, fu

* According to Simioni, Fazio Cardan (1445-1524), the father of Jerome, taught geometry in this school at some time after it was founded in 1502. The school itself seems to have endured until the year 1663, when it was closed " per mancanza di mezzi." See: Simioni, Attilio: Un umanista milanese, Piattino Patti. *Archivio storico lombardo* 2 (4th series): 5-50 (Sept.); 227-301 (Dec.) 1904.

† Campiglio wrote of the school: ". . . Tommaso Piatti aperse un ginnasio ove insegnate fossero pure gratuitamente da cinque professori l'Aritmetica, la Geometrica, l'Astronomia, la Dialettica e la Lingua Greca." See: Campiglio, Giovanni: *Storia di Milano, scritta dietro la scorta particolarmente di quella del Cavalier Carlo de' Rosmini.* Milan, Felice Rusconi, 1832, vol. 5, p. 114.

** It seems very doubtful that the prior actually had leprosy. Probably he was afflicted with some minor, self-limited disease of the skin.

ammesso a praticarlo, non opponendosi a questa deliberazione nessun articolo dello statuto." [49] This was only a half-victory for Cardan, since affirmation of his illegitimate birth was implicit in the decision of the college to permit Cardan to frequent the meetings. It is clear that he deeply resented the terms of the decision, for he much later wrote: [117] " Violentia quorundam Medicorum addactus sum anno M. D. xxxvi. seu xxxvii.* turpi conditione pacisci cum Collegio, sed ut dixi, postmodum dissoluta est, anno M. D. xxxix. & restitutus sum integrè."

It should occasion no surprise, therefore, to learn that Cardan's reaction to the " violence " of these physicians was similarly violent. He wrote a book which he hoped would serve to castigate his enemies: the *De Malo Recentiorum Medicorum Medendi Usu Libellus*,[66] printed by a famous Venetian publisher of the time, Ottaviano Scoto.† The book was Cardan's first; he wrote it in fifteen days. In the preface to the revised edition he admitted that the first edition had contained no less than 300 errors. The volume was successful financially, but otherwise it served only to infuriate further the Milanese physicians already arrayed against him.

Yet this little volume, so feverishly set down by a young and necessarily inexperienced physician, and conceived in rancor and spite, nevertheless pointed up the native shrewdness of its author: in the thirty-sixth chapter [118] he demonstrated clearly that he knew the difference between typhus fever (which he called ***morbus pulicaris***, or flea-like disease) and measles.[58] This observation probably left no deeper impress upon medicine of the time than did his remarks in the other chapters; but it has assured him of a place of honor in the history of clinical medicine.

In about the same year as that in which his book appeared, Cardan was invited to become professor of medicine in the University of Pavia. He refused the invitation because he doubted that a salary would be forthcoming [99]—additional evidence of the precarious condition of the social and economic structure in the north of Italy at this time. Next, Archinto asked Cardan to accompany him to Piacenza to meet the Farnese pontiff,

* Cardan wrote this only a year or so before his death. It is obvious that the exact year was not clear to him. The correct year, according to the records, was 1535, and not 1536 or 1537.

† The book may have been printed by Ottaviano Scoto or by his heirs. Scoto, a citizen of Modena, set up a press in Venice in 1480. His printing office became one of the largest in the city; after his death his heirs continued the business. See: Brown, H. R. F.: *The Venetian Printing Press. An Historical Study Based upon Documents for the Most Part Hitherto Unpublished.* New York, G. P. Putnam's Sons; London, John C. Nimmo. 1891, p. 33.

Paul III * (1468-1549), the " last Pope of the Renaissance," [107] who had been elected to the pontificate in 1534. It was the hope of Archinto that Cardan might become physician to Paul III, but although François de Brissac,† marshal of Francis I of France, joined Archinto in pressing the plan, all came to naught.[99] Cardan returned to Milan in great dejection.

In Milan Cardan forsook the practice of medicine to interest himself in mathematics. It was in this year (1536) that a Milanese waif of fourteen years, Louis Ferrari (1522-1565), " a neat rosy little fellow, with a bland voice, a cheerful face, and an agreeable short nose, fond of pleasure, of great natural powers " [119] but with " the temper of a fiend," [119] came to serve Cardan as an errand boy and to transcribe Cardan's *De Rerum Varietate*. Ferrari was the person who evolved the solution of equations of the fourth degree, as will be shown. It is said [119] that he was poisoned in 1565 by either his sister or her paramour. The influence which this penniless *famulus* exerted on the life of Cardan no longer is doubted by anyone.

In the thirty-third chapter [117] of the *De Vita Propria Liber* Cardan tells how, in 1536, he was summoned to the house of Count Camillo Borromeo, of the powerful Milanese house of that name, to treat the son of the count. His treatment of the boy was not successful; but his services to the count and to other members of the family evidently were highly valued, for Cardan regarded the house of Borromeo as constituting one of his chief patrons from that year onward. Another powerful man who was able to do much for Cardan was Alfonso d'Avalos (1502-1544), at the time governor of Milan, a skilful soldier and a generous patron of arts and letters. It should not be supposed that Cardan's evil days had departed. Yet he was in the process of attracting influential and discerning friends who did much for him in later years. And he doubtless was keenly aware of the possibilities of preferment which the support of such great political, military and ecclesiastical figures could bring to him.

In 1537 Cardan began to compose *De Sapientia* and *De Consolatione*. He himself thought that the *De Consolatione* was of no consequence, but it was translated into English by Thomas Bedingfield (d. 1613), a gentle-

* Thorndike has written an interesting essay on Pope Paul III in relation to science of the time. See: Thorndike, Lynn: *A History of Magic and Experimental Science*. New York, Columbia University Press, 1941, vol. 5, pp. 252-274.

† Dayre identified this man as Charles de Cossé de Brissac (1505-1563), and said that at the time he was governor of Piedmont. See: Cardan, Jerome: *Ma vie*. Traduction de Jean Dayre. Paris, Librairie Ancienne Honoré Champion, 1936, p. 211.

man pensioner to Queen Elizabeth of England, and was published [74] in London during the lifetime of Cardan.

On January 15, 1539, Cardan once more asked the College of Physicians for admittance. " Ben presto però anche la questione della nascita illegittima fu risolta con piena soddisfazione del Cardano." [49] At some time between March and August of 1539 the College of Physicians decided: " Presenti decreto ordinaverunt et declaraverunt quod legitimati per subsequens matrimonium, ubi aliud legitimum non repugnet, in collegium phisicorum admitti debeant." [49] Records [49] show that Cardan was called for examination on August 14, 1539, and that on August 30 he underwent a second examination. After he had stood for these two examinations, it was adjudged that he was worthy to take his place as a member of the college, without restriction of any kind.

Two years later, or in 1541, Cardan was elected rector of the College of Physicians. It was in that year that Cardan, as rector of the college, bore the canopy of the Emperor Charles V on the occasion of that monarch's entry into the city of Milan.[120] The event is relatively insignificant, excepting as it serves to emphasize domination of the north of Italy by the Spanish—a point that will be developed later herein.

A year later, in 1542, the fourth war between Charles V and Francis I of France broke out, occasioned by Charles' investiture of his son, Philip II (1527-1598), with the city of Milan. The University of Pavia was closed, and the faculty of medicine moved to Milan. The chair of medicine became vacant. It was offered to Cardan, who felt constrained to accept it. He had one son, Giambattista, born in 1534; a daughter, Chiara, born in 1536; and a second son, Aldo Urbano, newly born (1543). His mother had died in 1537, but had left neither money nor goods to her son, who was now obliged to find more money, somehow, than he had ever needed before. He therefore accepted the offer of the chair of medicine, albeit without more assurance of recompense than he had had at the time of his rejection of a similar offer in 1536. When in 1544 the University of Pavia was re-opened in Pavia, Cardan moved to that city to continue his professorship. There his salary was 240 gold crowns a year, but it appears that he did not actually receive it: " poichè non traeva alcun frutto dalle sue fatiche, tornossene a Milano." [91]

In 1545 the great *Ars Magna*,[71] " by which alone the name of Cardan holds a place in contemporary learning," [121] was published by Johannes Petreius in Nuremberg. It was edited by the vehement, coarse and arrogant German reformer and convert to Lutheranism, Andreas Osiander

(1498-1552), who in 1543 had seen the *De Revolutionibus* of Copernicus through the press in the same city.[122] The controversy between Cardan and Niccolò Tartaglia (1505-1557) which the publication of the *Ars Magna* revived will be considered in another chapter.

Cardan was now well known, perhaps more so as a mathematician and writer than as a physician, although he had a substantial income from the practice of medicine. In 1546 the gifted Farnese Pope Paul III (1468-1549), through Cardinal Giovanni Morone (1509-1580), sought the services of Cardan as an instructor in mathematics, but the offer was refused: "At ego qui, ut dixi, Harpocraticus sum, dicebam summus Pont: decrepitus est: murus ruinosus, certa pro incertis derelinquam?"[99] As the year 1546 ended, Cardan's wife died. It cannot be said that he had ever manifested an overpowering affection for her; on the other hand, he grieved genuinely for her, and wrote of her with compassion.

Cardan, in the autumn of 1546, had begun to teach again at the University of Pavia. In 1547 Andreas Vesalius (1514-1564), the renowned anatomist whose *De Humani Corporis Fabrica Libri Septem* had been published at Basel four years previously, sent to Cardan to ask him to become personal physician to the sovereign of Denmark, King Christian III (1503-1559), at a salary of 300 gold crowns and 600 more to be paid from the proceeds of a tax on skins.[91, 117] The offer was refused: Denmark under King Frederick I (1471?-1533) had begun to embrace Lutheranism; under King Christian III the new doctrine had become firmly established.[128] Cardan, a Roman Catholic, was sure he would not be able to endure the heretical religion, the dank climate, or the Danes themselves, who he thought were virtual barbarians.[117]

Three years later the old familiar struggle of the Emperor Charles V against the French flared up again. The resourceful Farnese Pope Paul III had died. In his place was Giovanni Maria del Monte (1487-1555), elected in 1550 as Julius III. Ottavio Farnese (1521-1586), deprived of both Piacenza and Parma, had been restored as ruler of Parma by Pope Julius; but that pontiff could not persuade the Emperor Charles V to return Piacenza to Ottavio. Ottavio then quarreled with Julius, and sought succor from his allies, the French. Once again the Gallic hosts poured down into northern Italy, and once again the University of Pavia was closed.

Cardan thereupon returned to Milan. But he was not to be idle. The physician of John Hamilton (*c.* 1511-1571), archbishop of St. Andrews, had read in *De Sapientia* that Cardan could cure phthisis, from which it was believed the prelate was suffering. This physician wrote to Cardan in

Milan,[124] asking him to write in return, and suggesting that the Milanese physician meet Archbishop Hamilton in Paris. Ultimately, Cardan accepted, agreeing to meet the churchman in Lyons, not Paris. The entire adventure has been recounted [12, 125, 126] adequately by several authors; it will be sketched in briefest detail herein. Cardan reached Lyons on March 13, 1552, and remained there forty-six days, waiting for the Scotch churchman. Archbishop Hamilton never appeared. Instead, his physician finally reached the place. He begged Cardan to go with him to Edinburgh to treat the ailing prelate. Cardan agreed, and the two started down the River Loire for Paris. At Paris Cardan saw Jean Fernel (1497-1558) of Amiens, professor of medicine in the University of Paris, as well as the uncompromising Galenist and one-time teacher of Vesalius, Jacques Dubois * (1478-1555). There seems to be no doubt that Cardan was highly respected in Paris, and that he was handsomely entertained by important men.[127] But what seems to have impressed him in particular was the horn of what he said [127] was a true unicorn in the private treasure vaults of the king of France in the church of Saint Denis in Paris.

Cardan and the archbishop's physician proceeded to Boulogne and then to Calais, crossed the channel to London, and reached Edinburgh on June 29, 1552. The reception accorded him by the Scotch is curious: he was considered a magician or astrologer, possibly because at that time ". . . ceaux qui recherchoient les Mathematiques & les sciences le moins communes, étoient soupçonnes d'être Enchanteurs & Magiciens . . . ." [128] Waters [129] said that at Monimail, near Cupar in Fife, "there is a well called to this day [1898] Cardan's Well."

For six weeks Cardan did nothing at all toward therapeusis; instead, he permitted the archbishop's physicians to care for the patient entirely. The churchman steadily became worse. Cardan then intervened, prescribed an intricate set of measures, and saw his patient improve. Eager to return to Milan because he knew the cold Scotch winter was almost at hand, Cardan left Edinburgh in September and journeyed to London, where he was received by King Edward VI (1537-1553). It is possible that Cardan was presented to the Tudor monarch by the celebrated scholar, Sir John Cheke (1514-1557), whom the Milanese knew. When Cardan saw the last male Tudor, the monarch was even then slowly dying of tuberculosis. Cardan's impression, however, was most favorable: he found

* Dana (reference 12) was in error when he said that Dubois "had a way of giving his name to different parts of the body." Dana must have been thinking, mistakenly, of the Dutch scientist, François de la Boe (1614-1672), whom Cardan obviously could not have met in 1552.

that Edward knew of *De Varietate*, the manuscript of which Cardan had taken with him to Scotland, and which he dedicated to the king. Cardan discovered that Edward could speak Latin and French, and that he knew Greek, Italian and Spanish. Edward presented Cardan with 100 crowns, and the Milanese later intimated that he could have had 800 more—or perhaps 1,000 more—if he had been willing to recognize Edward as *Fidei Defensor*, which he would not do.[127]

From London Cardan went to Dover, where he met an English boy of about twelve years. The boy pleased him so much that he took him to Milan with him, after securing the assent of the father of the boy to such a project. This boy became known as William Cardan (1540-1561). Cardan soon tired of him, and apprenticed him to a tailor in Pavia. The boy died of fever in 1561, and Cardan seems to have grieved for him.*

Cardan returned to Italy over a most circuitous route, in the course of which he saw a number of men, one of whom was Conrad Gesner (1515-1565) of Zurich, "the German Pliny." In Milan Cardan worked steadily at his writings. He was perhaps as busy during this period as he was ever to be, but he was not to labor in peace. A new enemy arose in the person of the redoubtable Italian polemist and philologist, Julius Caesar Scaliger (1484-1558), at the time living in France. Scaliger, who in 1531 and subsequent years had made venomous assaults upon the Latinity of Desiderius Erasmus (1466-1536), now sought to furbish his reputation by an onslaught against Cardan. He attempted to show in his *Exotericarum Exercitationum Libri XV De Subtilitate, Ad Hieronymum Cardanum* that the indicated work was no more than a tissue of nonsense. Cardan for the moment did nothing. Scaliger, eager for some sort of a reply or defense, sat fuming because none was forthcoming. Finally, someone told the polemist that Cardan had succumbed to mortification as a result of Scaliger's strictures. Scaliger, out of whatever impulse, then composed a verbose panegyric on his quondam adversary, calling him a "mighty and matchless scholar" [130] and a man of royal courtesy, of most high mind, gentle, and eminently suited to any station or destiny that might come to him.[130] Cardan ultimately replied to Scaliger with *Actio Prima, in Calumniatorem Librorum De Subtilitate*,† [131] but in this piece he did not once mention the name of Scaliger. It was the opinion of Naudé [132] that Cardan had managed to best Scaliger in almost every aspect of the

* See "Dialogus de Morte, cui Titulus est Guglielmus," on pages 673-674 of volume 1 of the *Opera Omnia*.

† This piece was appended to *De Subtilitate* in the edition of 1560, printed at Basel by Henry Petri. It follows Book XXI in that edition.

controversy; he declared that Scaliger in attacking *De Subtilitate* actually had committed more errors than those he had censured in Cardan's work, and he said that Scaliger's chief object in the assault had been not so much to reveal the truth as to satisfy his own driving ambition * to come to blows with the chief literary men † of his age. Bayle [24] concurred thus: "Sans s'éloigner le moins du monde de la vraisemblance, on peut dire que l'envie de s'aquérir un grand nom par la gloire de son Adversaire poussa Jules Cesar Scaliger à écrire contra Cardan. S'il avoit eu un peu moins de démangeaison de contredire, il auroit aquis plus de gloire, qu'il n'a fait dans ce combat. . . ." But De Thou, [15] who knew Cardan at least by sight, thought Scaliger's criticisms were just.

Cardan himself referred to Scaliger in the forty-eighth chapter [65] of *De Vita Propria Liber*, saying that Scaliger had criticized him only to make a reputation thereby. He added maliciously, in reference to the extravagant eulogy of himself by Scaliger: "Julius Caesar Scaliger plures mihi titulos ascribit, quam, ego mihi concedo postulassem, appellans *ingenium profundissimum, felicissimum, et incomparabile.*" [65] Cardan, it must be admitted, was a man for whom the making of enemies was the easiest thing in the world. He who reads the *De Vita Propria Liber* must inevitably perceive that the Milanese was crochety, suspicious, often ungrateful, and no mean practitioner of intrigue and deception. But in this instance—the controversy with Scaliger—the evidence at hand indicates that he had been attacked without just cause, and that in the field of polemics, at least, he bested his brilliant adversary.**

* "Est-il juste, en effet, que, parce qu'un critique ne veut pas perdre la peine qu'il a prise à relever les fautes d'un ouvrage, il fasse publiquement le procès à l'auteur pour des erreurs qu'il a déjà corrigées de lui-même? C'est précisément ce que Scaliger craignait de trouver dans cette seconde édition; il prit donc le parti beaucoup plus simple, si ce n'était le plus juste, de ne pas la lire." See reference 41. There is some doubt as to the particular edition of *De Subtilitate* which Scaliger used as the basis for his assault. But there is little doubt that a corrected edition of *De Subtilitate* was available long before Scaliger's strictures were printed.

† Charles Nisard (1808-1889) included an account of the controversy between Scaliger and Cardan in his well-known work on literary battles and disputes. He concluded: "Je n'ai pas besoin d'adjouter que Scaliger avait la plus fière opinion de son livre: mais le sentiment de l'auteur n'est celui des érudits. La Monnoye qui a déjà bien jugé le style de ses lettres, trouve avec la même raison et déclare avec la même vérité, que le style des *Exercitations* tantôt est inégal et barbare, tantôt affecté et bouffi. Naudé assure que Scaliger y a fait plus de fautes qu'il n'en a repris dans Cardan, et que la réponse de ce dernier *a coulé à fond* toute sa critique." See: Nisard, Charles: *Les Gladiateurs de la république des lettres aux XV^e, XVI^e et XVII^e siècles.* Paris, Michel Lévy Frères, 1860, vol. 1, pp. 370-371.

** The celebrated encounter was well known to Isaac D'Israeli (1766-1848), as might be expected, since D'Israeli was an authority on the quarrels and tribulations of authors.

In 1559 Cardan was stricken by a catastrophe from which he never entirely recovered: the murder committed by his son, Giambattista. The son had married a loose young woman in 1557, against every wish of Cardan. The two young people had children—a boy and a girl—but progeny apparently could not strengthen the tenuous bond between man and wife, for they bickered constantly. There was some ground, it would appear, for the suspicion that the wife was unfaithful to Giambattista, after the marriage. Finally, the wretched youth, whom Cardan once described [188] as deaf in the right ear, with small, restless white eyes and a slight hump, contrived to have a servant make a poisoned cake. This was given to the wife, who lay ill of a severe fever. At the time the deed was committed Cardan was in Pavia. He had just succeeded in defeating a celebrated physician, Andrea Camuzio (?-1578), in a long disputation as to the decisions of Galen. Apprised that Giambattista's wife was dead, and that Giambattista had been arrested, Cardan hurried to Milan. Days passed. Cardan worked frantically in behalf of his son, but his acquaintance with influential Milanese citizens was of no aid to him. Ultimately, Giambattista confessed that he had murdered his wife. This confession only added to Cardan's enormous task of attempting to prove the innocence of his son. Nothing prevailed. Giambattista was beheaded in prison on the night of April 7, 1560. According to Bellini,[184] the right hand of the condemned man was struck off before he was decapitated.*

"The record of Cardan's life for the next two years is a meagre one,"

In his *Curiosities of Literature*, which first appeared in 1791, D'Israeli wrote: "The same Scaliger, acting on the same principle of distinguishing himself at the cost of others, attacked Cardan's best work *De Subtilitate*; his criticism did not appear till seven years after the first edition of the work, and then he obstinately stuck to that edition, though Cardan had corrected it in subsequent ones; but this Scaliger chose, that he might have a wider field for his attack. After this, a rumor spread that Cardan had died of vexation from our Julius Caesar's invincible pen; then Scaliger pretended to feel all the regret possible for a man he had killed, and whom he now praised: however, his regret had as little foundation as his triumph; for Cardan outlived Scaliger many years, and valued his criticisms too cheaply to have suffered them to have disturbed his quiet." See: D'Israeli, Isaac: *Curiosities of Literature*. London, George Routledge and Sons, 1867, p. 118.

* If Bellini's statement is correct, the stigma which Cardan noticed on his own right hand prior to Giambattista's death was indeed a grisly portent. In the thirty-seventh chapter of *De Vita Propria Liber* Cardan said that about fifty-three days before his son was executed, he beheld at the root of his ring finger on his (Cardan's) right hand a mark shaped like a gory sword. This mark gradually lengthened and extended up the finger until, on the day of the execution, it had attained to the very tip and was fiery red. On the morning after the execution of Giambattista the mark had almost vanished. None of Cardan's biographers has linked the appearance of this stigma to the amputation of Giambattista's hand.

Waters [188] wrote in 1898. Since that year, however, considerable material about Cardan has been discovered. Soriga,[50] for instance, found that on August 7, 1560, Cardan, *Lector in felici Gymnasio Ticinensi*, " sotto l'impressione della tragica fine del figliolo Giovanni Battista, avvenuta nell'aprile dello stesso anno, invocata la misericordia divina, fa rogare dal notaio Matteo Cellanova un testamento . . ." in which he directed that if he died, his body was to be interred in the monastery of Saint Mark in Milan, and that the expenses of his funeral should not exceed " la somma di dieci scudi." [50] Cardan's nephew, Faciolo, was to receive certain precious jewels for the purpose of financing his education; if this nephew succeeded in obtaining the doctorate, he was to receive the paternal house. A second will was drawn up on July 4, 1561, in which, among other provisos, Cardan directed that the phrase, *Ingrata patria, quid tibi feci?* [50] be engraved on the tombstone which might later be erected to his memory. On the tomb of Giambattista he wished the following phrase to be placed: *Johannes Baptista Cardanus, Hyeronimi* [*sic*] *filius, medicus, quem senatus capite mulctavit . . . non hunc sed Barabam.*[50] He asked that his nephew Faciolo and his son Aldo have a certain master as tutor, and that two revised and corrected sets of his unpublished writings be prepared: one to be sent to a printer for publication, the other to be given to the administrators of the Ospedale Maggiore in Milan.[50]

Cardan relates in the *De Vita Propria Liber* [120] how he resolved to resign from the faculty of the University of Pavia in 1562. In May of that year he had been asked to join the newly founded Accademia degli Affidati of Pavia, members of which included scholars, cardinals, princes and ultimately, King Philip II (1527-1598) of Spain. It would seem that he joined this academy against his will; he said [120] that the first time he entered the room used by the organization he saw a great beam poised above his head in such wise that it might easily tumble down and kill him. He was not sure that the beam had not been balanced thus by the evil designs of his enemies. At any rate, he thenceforward invented reasons for not attending sessions of the academy. The experience with the poised beam also fortified his intention to sever himself from the University of Pavia, since several of his enemies were members of both the faculty of that institution and the Accademia degli Affidati.

Soriga [50] wrote that on March 23, 1562, some time before Cardan's entrance into the aforementioned academy, the Senate of the University of Bologna elected him professor of medicine * in that university. The action

* Costa (reference 45) wrote that Cardan was elected professor of the theory of medicine.

resulted, at least in part, from the friendly intercession of the great churchman and reformer, Cardinal Carlo Borromeo (1538-1584), at the time legate of Pope Pius IV * (1499-1565) to the city of Bologna. Another friend of Cardan, Cardinal Francesco Alciato (1522-1580), secretary to Pope Pius IV, probably intervened with Borromeo to press the candidacy of Cardan. Cardan at once named Alciato as his personal representative in Bologna, with the power to arrange the details of salary.[50] But enemies arose at once, even in Bologna. One of them came to Pavia, made or pretended to make an investigation, and returned to the Senate in Bologna with the report that at the University of Pavia Cardan had lectured to empty classrooms, that he was unskilled in medicine, and that he was by all tokens an evil fellow. But Cardinal Borromeo interposed the remark that Cardan had once cured his mother when all other physicians had despaired of her life. Another man likewise defended the skill and integrity of Cardan, and the chair of medicine was won.[136] The terms, however, were not satisfactory to Cardan, and negotiations in this respect continued.

Cardan finally resigned his professorship at Pavia in June of 1562, but according to Soriga [50] did not commence to teach at Bologna until November of that year. It was finally agreed that he was to receive 521 *scudi* for a single year, at the end of which a new arrangement would be made.[45] Before he left for Bologna, Cardan drew up a third will, on July 18, 1562. In this instrument he reaffirmed his desire to be buried in the Augustinian monastery of Saint Mark in Milan, and he disposed of some valuable rings and other pieces of jewelry. He also stipulated that certain funds of his should be used for the education of his daughter's children. Included

* Cardinal Borromeo actually was the nephew of Pope Pius IV. This pontiff was born Giovanni Medici; he was not, however, related to the famous Florentine family of that name. Of Borromeo a famous scholar has written: "Einen noch grösseren Einfluss [than that of Bishop J. Matteo Giberto of Verona] aber hatte Carl Borromeo selbst. Bei den mancherlei Würden und Aemtern, die er besass—er war unter anderem Grosspenitenziere—, als das Oberhaupt der Cardinäle, die sein Oheim gewählt, hätte er in Rom eine glänzende Stellung einnehmen können; aber er gab alles auf, er schlug alles aus, um sich in seinem Erzbisthum Mailand den kirchlichen Pflichten zu widmen. Er that dies mit ungemeiner Anstrengung, ja mit Leidenschaft. In allen Richtungen bereiste er fortwährend seine Diöces: es gab in derselben keinen Ort, den er nicht zwei, drei Mal besucht hätte; in das höchste Gebirge, in die entlegensten Thäler verfügte er sich. . . . Während er in seiner Capelle betete, ward auf ihn geschossen. Niemals aber war ihm etwas nützlicher, als dies Attentat. Das Volk hielt seine Rettung für ein Wunder und fing von diesem Augenblick erst recht an, ihn zu verehren." See: Von Ranke, Leopold: *Die römischen Päpste in den letzten vier Jahrhunderten. In: Leopold von Ranke's Sämmtliche Werke.* Leipzig, 1889, 3rd collected edition (9th edition of *Die römischen Päpste*), pp. 237-238 of volume 37 [section on Pius V in *Die römischen Päpste*].

in this will was a list of the works which Cardan particularly wished to be published after his death. The list included *De Subtilitate Lib. XXI, De Rerum Varietate, De Utilitate Capienda ex Adversis Lib. IIII, De Urinis Lib. IIII, Metoposcopia Lib. XIII,** and a number of others.[50]

At the University of Bologna, to which Cardan removed at some time near the end of 1562,† he found his old friend and one-time *famulus*, Louis Ferrari (1522-1565),** who was a lecturer on mathematics. There were other friends, also; but in many respects the life of Cardan at Bologna was far from happy. He wrote [186] that enemies almost at once began to conspire against him. One of them was the professor of the practice of medicine; the enmity of this man actually seems to have been the result of Cardan's robust disregard for tact and the ordinary amenities of pleasant relations. The man had been dissecting in public, and was quoting a line in Greek to support his statement of the moment. In his quotation he chanced to omit a negative qualifier. Cardan corrected the man before a number of people, and thus gained the tenacious ill will of the professor.

Nevertheless, on April 3, 1563, Cardan was confirmed as professor of the theory of medicine at a salary of 700 *scudi* a year.[45] In the act which

* This particular treatise was not included by Spon in the *Opera Omnia* of Cardan which were published in 1663 at Lyons. It was first printed in Paris in 1658 by Thomas Jolly in at least two versions: a Latin edition and a French edition by Claude Martin Laurendière. The French edition, a copy of which is owned by the Library of Congress, has the following full title: *La Metoposcopie de H. Cardan, Medecin Milanois. Comprise en treize livres, et huit cens figures de la face humaine: A laquelle a esté adjousté, le Traicté des Marques Naturelles du Corps, par Melampus, Antien Autheur Grec: Le tout Traduit en François par le Sieur C. M. de Laurendiere Docteur en Medecine.* Paris, Thomas Jolly, 1658. Pp. 225. A Latin edition is owned by the Army Medical Library, Washington, D. C. The full title of this edition is: *H. Cardani Medici Mediolanensis Metoposcopia Libris Tredecim, et Octingentis Faciei Humanae Eiconibus Complexa: cui Accessit Melampodis de Naevis Corporis Tractatus, Graece et Latine nunc primum editus: interprete Claudio Martino Laurenderio.* Paris, Thomas Iolly, 1658. Pp. 225.

† In this year Cardan's *Somniorum Synesiorum* was published at Basel by Henry Petri. The full title of this work is: *Somniorum Synesiorum, omnis generis insomnia explicantes, Libri IIII. Per Hieronymum Cardanum Mediolanensem Medicum ac Philosophum. Quibus accedunt, eiusdem haec etiam: De libris proprijs. De curationibus & praedictionibus admirandis. Neronis encomium. Geometriae encomium. De uno. Actio in Thessalicum medicum. De secretis. De gemmis & coloribus. Dialogus de morte. Dialogus de humanis consilijs, Tetim inscriptus. Item ad Somniorum pertinentia: De minimis & propinquis. De summo bono. Cum gratia & priuil. Caes. Maiest.* Basel, Henry Petri, 1562. But the copy examined by the writer at the Library of Congress lacks the twelve additional works listed above, and contains only the *Somniorum Synesiorum*, a work of 278 pages printed in an exceptionally attractive cursive face.

** Cardan's "Vita Ludovici Ferrarii Bononiensis" appears on pages 568 and 569 of volume 9 of the *Opera Omnia.*

established his reappointment, it was recognized that he was famous throughout Europe as a physician and philosopher, and attention was specifically called to his great skill in curing patients and to his gift for teaching. On May 26 of the same year a very real distinction was conferred upon Cardan by the Senate: he was made a citizen of Bologna. Bertolotti,[87] quoting from material taken from the *Libro d'oro* of Bologna, reproduced this statement:

> Quindi a dimostrargli il pregio, in che tenevasi, e ad affezionarlo sempre più a stabilire la sua costante abitazione in questa *Città* credette il *Senato stesso* di doverlo decorare della Cittadinanza in *forma satis ampla*, compresi i Figli maschj di esso legittimi, e naturali, e tutti i suoi Discendenti, siccome fece li 26 maggio 1563, nel qual giorno medesimo per dargli un nuovo più chiaro argomento di affezione, e di quel singolare riguardo, che per *Lui* aveva con altro distinto e speciale *Sen. Cons.* gli concesse l'esenzione urbana dal pagamento della Gabelle delle *Porte*, della *Macina*, e dello *Sgarmigliato*, (toltone però l'aumento) per *Lui* e per tutta la sua *Famiglia*, della quale esenzione però dovesse godere dal principio del susseguente anno 1564 in avvenire finchè avesse continuato ad abitare in *Bologna*, e a leggere nell'*Archiginnasio*.

Cardan's recognition of this signal honor was evident; on the title page of his *Ars Curandi Parva*,[72] printed at Basel in 1566, his name appears thus: "Hieronymi Cardani Mediolanensis Civisque Bononiensis," as was similarly true of *In Librum Hippocratis de Alimento*,[78] printed in Rome in 1574, three years after Cardan had left Bologna in bitter disgrace. Even in his last year of life Cardan felt moved to observe: "Decoratus praeterea sum civitatis beneficio à Bononiensi Senatu."[187]

In 1566 Cardan made another will,[87] in which he said he was then sixty years old. Apparently he had bought a house near the church of Saint John in Monte; he asked that his body be interred at this church, and that the remains of his father and his son, Giambattista, be brought from the Augustinian monastery of Saint Mark in Milan, to rest near his own in Bologna. For the monastery of Saint Mark he provided "scudi dieci d'oro affinchè permettessero tale trasporto."[87]

On June 28, 1570, the Senate reappointed Cardan to a two-year tenure that was to end in November of 1573.[45] But disaster again overtook him: he was suddenly arrested and cast in prison, where he languished from the early part of October to almost the new year of 1571. Sprengel[188] thought this incarceration was the result of Cardan's excessive debts and the actions of his creditors; but this conception no longer is entertained, in the light of additional evidence. Bertolotti[87] was of the opinion that Cardan's imprisonment was precipitated by certain misdeeds of his son, Aldo

Urbano. This view, like that of Sprengel, no longer is accepted, although the investigations of Rivari [139] certainly show that in 1570 Cardan caused Aldo Urbano to be arrested and banished from Bologna. Rivari [139] came upon documents which indicated that on July 22, 1569, Cardan had reported to civil authorities the theft, by his son Aldo and a companion, of money and jewels. On July 27 of that year Cardan once more sought the aid of the authorities, reporting that Aldo had threatened to set fire to the paternal home and burn his father to death. Aldo's accomplice in the robbery was sentenced to lifetime service in the galleys; Aldo was imprisoned until May 22, 1570, when with the consent of Cardan he was released. He was banished from the city and territory of Bologna. Cardan's experiences with all his children were far from happy, although the picture presented by Kümmel [47] probably is exaggerated:

> Mit seinem Kindern hatte er wenig Glück. Kein Vater konnte je Grausameres erlebt haben, als er. Sein ältester Sohn Johannes Baptista hatte ein buhlerisches Weib zur Frau, die er vergiften wollte, wofür man ihn 1558 [*sic*] in Mailand enthauptete. Der Vater wurde darüber gemutskrank. Der zweite Sohn, Caveleorus, war ein tobsüchtiger Raufbold, der dem Vater im Zorne ein Ohr abbiss, wofür ihn Hieronymus Cardanus enterbte und ins Gefängnis schickte. Er wurde erschossen. Eine Tochter, das einzige Kind, das ihm geblieben war, brannte mit einem Galan durch und endete als Dirne.*

Cardan disinherited Aldo Urbano, but it has been shown [87] that even in his last will, drawn up on August 26, 1576, he remembered his ingrate son with a small bequest: he provided Aldo with a stipend of six gold *scudi* a week, on condition that Aldo never live in any city in which Cardan's nephew, Faciolo, was a resident.

It must be admitted that few if any investigators now believe that Cardan had been imprisoned in Bologna because of the evil deeds of his son or because of his own debts. Rivari [140] in 1920, for instance, wrote that he had consulted the *Rotuli dei Lettori Legisti e Artisti dello Studio Bolognese*, and that in the section devoted to the years 1570 and 1571, under the title "Ad lecturam Theoricae medicinae post tertiam," the name of the lecturer was missing. At the bottom of the page was the notation:

> Il nome di Girolamo Cardano, che dapprima era stato scritto a questo luogo, fu poi abraso, come s'apprende dalla seguente annotazione che si legge nella minuta: *Die veneris 27 octobris 1570: de mandato illustrissimi Domini Legati et Senatus erasus fuit dominus Hieronimus Cardanus de albo artistarum, eo quod predictis*

* There is no authority, so far as the writer knows, for the statements contained in the final two sentences.

illustrissimo domino Legato et Senatui a reverendissimo inquisitore ex literis officij sanctissimae Inquisitionis Romae significatum fuit posse provideri de alio lectore, attenta ipsius Cardani retentione etc.

At some time near the beginning of the year 1571 Cardan was released from prison and allowed to stay within his own home, under a heavy bond of gold. He was forbidden to publish any more books, and was privately advised by his friends that it would be better if he resigned his chair at the University of Bologna. One of these friends was Cardinal Giovanni Morone [136] (1509-1580), who in 1546 had sought to secure the services of Cardan as an instructor in mathematics at the court of Pope Paul III (1468-1549). Cardan followed the churchman's advice.

Battistella [141] has shown that:

Il 18 febbraio la S. Congregazione impone al Padre inquisitore di Bologna che costringa ad *abiure de vehementi* Girolamo Cardano e proibisca i suoi libri, principalmente il *De Rerum Varietate*, ossendosi trovati in esso degli errori in materia di fede; il 10 marzo gli aggiungo che quell'abiura gliela faccia fare privatamente, *coram congregatione* soltanto, e gli dica che Nostro Signore non vuolo che egli legga più nè mandi alle stampe opera alcuna: codesta però non dovra essere inserito nella sentenza.

The action of March 10, referred to in the foregoing paragraph, probably was communicated in a letter [140] of that date, written by the Cardinal of Pisa to Antonio Baldinucci, who at the time was inquisitor general of Bologna:

Reverendo Padre come fratello ecet.

Intorno la speditione del Cardano di che ne ricercate il parer nostro con la vostra di XXIV del passato vi dicemo che lo dovete far abiurar privatamente coram congregatione et gli direte di poi che N. S.re non vuole ch'egli legga più ne che faccia stampare opera alcuna. Et questo basterà, ch'egli lo sappia, senza altrimente inserirlo nella sentenza. Di Roma il di X di Marzo del 1571.

Il Card.lo di Pisa.

Cardan himself nowhere discloses the reason for his imprisonment. It may be true that he was incarcerated for having dared to cast the horoscope of Jesus Christ,* as has been said,[110] or because his writings were skeptical and atheistic, as Spizelio [21] complained, or heretical, as Castiglioni [61] and

* "Il Cardano pazzamente fidando nell'astrologia, come tanti che lo avevano preceduto ed altri che lo seguirono, fra il quali anche Tomaso Campanella, volle un giorno, mentre era ancora in Bologna, tentare l'oroscopo di Gesù Cristo e determinare dai segni del cielo la fine dell'umanità; per il che fu trattenuto in carcere per alcuni mesi; dopo i quali passò nel 1571 a Roma, dove più tardi mori." See: Cavazza, Francesco: *Le scuole dell'antico studio bolognese.* Milan, Ulrico Hoepli, 1896, p. 280.

Vidari [109] styled them. Lessing [81] indicated that he was aware of the charge involving the horoscope of Jesus Christ, but seemed to believe that the eleventh book of *De Subtilitate* actually was the particular work which brought Cardan into such grievous straits. Lessing [81] paraphrased De la Monnoye to demonstrate the reason: "In dem eilften seiner Bücher *de subtilitate* vergleicht er die vier Hauptreligionen kürzlich unter einander; und nachdem er eine gegen die andre hat streiten lassen, so schliesst er, ohne sich für eine zu erklären, mit diesen unbedachtsamen Worten: *igitur his arbitrio victoriae relictis.* Das heisst auf gut deutsch, er wolle dem Zufalle überlassen, auf welche Seite sich der Sieg wenden werde." Lessing also noted that all earlier commentators had spoken of the eleventh book of *De Subtilitate* as *locum impium & scandalosissimum, locum offensionis plenissimum.* Thus, three works by Cardan could have served as the basis for the charges against him and the resultant imprisonment: *De Subtilitate*, *De Rerum Varietate* and *Cl. Ptolemaei Pelusiensis IIII de Astrorum Iudicijs.**†

But it seems likely that Cardan in 1570 was the unwitting victim of the Counter Reformation in Italy, as Vidari [44] suggested, and that he was not arrested and imprisoned simply because he had written a work of impiety, or because he had gotten into debt, or because his son had committed a series of evil deeds. It should be remembered that Michaele Ghislieri (1504-1572), "il forte restauratore del cattolicismo," [44] had been elected pontiff as Pius V in 1566. In the same year as that (1570) of Cardan's arrest and imprisonment, this devout and ascetic churchman had brought about the anathematization of Elizabeth of England. Under his direction the decisions of the Council of Trent had been further embodied in the *Catechismus Romanus* (1566), the *Breviarium Romanum* (1568), and the *Missale Romanum* (1570). Pius V was above all else devoted to the

* See reference 317.

† In a recent history of the University of Bologna, published only six years ago, it was written: "Volendo parlare di medici puri, non troviamo figure che abbiano lasciato uguali tracce di scoperte scientifiche, benchè molti di essi abbiano avuta grande notorietà anche oltre Bologna. Un nome emerge per la sua celebrità avvolta di mistero: quello di Girolamo Cardano (1563-70), milanese, qui chiamato alla cattedra eminente di medicina teorica, per succedere a Benedetto Vittori di Faenza (1539-61), che (già lettore fra noi dal 1512 al' 31), vi era stato richiamato da Padova con l'onorario di 700 scudi. Il Cardano ebbe a Bologna gravi dispiaceri e infine venne, come si è detto, incarcerato nel 1570 dall'Inquisitore per il suo libro *De rerum varietate*, in cui fra l'altro è tentato l'oroscope de Cristo. Uomo di grandissimo ingegno e vasta erudizione, ma più inclinato alla speculazione astratta e alle matematiche, di carattere torbido, con una fede cieca nell' astrologia, non pare che abbia contribuito ai progressi concreti della scienza medica. Dopo il processo dovette abbandonare la lettura." See: Simeoni, Luigi: *Storia della Università di Bologna.* Bologna, Nicola Zanichelli, 1940, vol. 2 [L'Età moderna (1500-1888)], p. 54.

strengthening of the Roman church in Europe after the alarming defections of the Reformation, and northern Italy, as is well known, was a region not remarkable for subservience to the Holy See. On the basis of the evidence available, it would appear that Cardan was punished, not because he was a person who had written suspect works, but because he happened to live in an age in which any deviation from an authority that had just sustained a multitude of powerful assaults was certain to be investigated exhaustively. This contention is supported by the nature of Cardan's punishment: he was forbidden to lecture in the University of Bologna, he was restrained from publishing any more of his books, and he was imprisoned. But at no time was his life in danger. In fact, after a period he was permitted to return to his own home. Finally, ". . . forse per compensarlo in qualche modo della punizione, il Cardano venne tosto invitato a Roma e pensionato dal papa." [44] * Such is not the destiny of a man who has erred wilfully and grievously against the Roman church. Rather, it is the fate of a man who, for the sake of appearances, must be punished in the eyes of his compatriots, but who is readily forgiven and even compensated for his pains, once an example has been made of him. It would be a gross misstatement of fact to assert that Cardan was a precursor of Bruno or Galileo.

It is well to remember that even under the pontificate of the easygoing Leo X (1475-1521), himself a son of the brilliant and worldly Lorenzo de' Medici (1449-1492), another great professor in the University of Bologna had come to grief for certain of his writings in the year 1516. He was Pietro Pomponazzi (1462-1525), at the time professor of natural and moral philosophy at Bologna. Pomponazzi, in consequence of the publication of his *De Immortalitate Animae*, encountered much the same difficulties [162] that were to beset Cardan in 1570.

It may be, as Vidari [44] said, that soon after his release from imprisonment and confinement in his own house, Cardan was invited to Rome. But it may also be that Cardan went to Rome in accordance with the plans of the authorities, so that his actions could be subject to the surveillance of the ecclesiastical powers. It may be noted that his *In Librum Hippocratis de Alimento* [78] was printed at Rome in 1574 "Cum licentia Superiorum."

Cardan reached Rome in the fall of 1571. He lived first in the Piazza of Saint Jerome, and later in the Via Giulia, near the church of Saint

* Curiously, Vidari in 1904 (reference 44) suggested that Pius V was the pontiff who gave Cardan a pension, but in 1930 wrote (reference 109) that it was Gregory XIII (1502-1585) who conferred this pension.

Mary of Monserrato, where he probably died. He began to practice medicine, and apparently achieved considerable success in this field. Of this particular period he wrote:[99] ". . . inde veni Romam die pugnae contra Turcas celebratae, Nonis Octobris. Nunc vero exactus est, ab ea die ingressus in Urbem annus quartus, à carcere quintus, ex quo ut privatus dego, nisi quod Collegium Romanum Idibus Septembris me recepit, & Summus Pontifex pensionem exhibet." If Cardan wrote this passage in either 1575 or 1576, the pontiff was Gregory XIII,* or Ugo Buoncompagno (1502-1585), who in 1582 promulgated the Gregorian calendar.† Bertolotti[87] said that Cardan became the personal physician of this pope.

Cardan also wrote much at Rome, and revised much of what he had written before he had come to that city. In 1573, for whatever reason, he burned no less than 120 of the books he had written during his lifetime. Costa[45] has shown that Cardan almost to the end entertained hopes of returning to Bologna and to the chair of the theory of medicine in the University of Bologna. Costa[45] reproduced a letter written on April 28, 1573, by Cardan, to the secretary of the government at Bologna, in which the desire of the Milanese to return to Bologna is clearly expressed. The chair of medicine at Bologna seems to have been of secondary importance to Cardan:

> Anche più del ritorno alla cattedra, il Cardano avrebbe bramato l'assegnazione di una pensione in Bologna, che gli desse modo di risiedervi prestando l'opera sua nel medicare. Ma codesto suo desiderio non ebbe adempimento. La pensione l'ottenne, ma in Roma, dove egli terminò la vita tre anni appresso.[45]

De Thou[15] saw Cardan during these last years, and although he had to admit that the fame of Cardan was still evident, he recorded an unfavorable impression: " Romae eum diverso ab aliis cultu incedentem paucis ante obitum annis conspicati et adlocuti ac saepius admirati sumus, cum

* Michel de Montaigne (1533-1592) saw Pope Gregory XIII in Rome, four years after the death of Cardan. He described the pontiff thus: "c'est un très-beau vieillard, d'une moyenne taille & droite, le visage plein de majesté, une longue barbe blanche, eagé [agé] lors de plus de quatre-vins ans, le plus sein [sain] pur cet eage, & vigoureus qu'il est possible de desirer, sans goute, sans colicque, sans mal d'estomach, & sans aucune subjection: d'une nature douce, peu se passionant des affaires du monde, grand bâtissur, & en cela il lairra à Rome & ailleurs un singulier honneur à sa mémorie; grand aumosnier, je dis hors de toute mesure." See: *Journal du voyage de Michel de Montaigne en Italie, par la Suisse & l'Allemagne en 1580 & 1581, avec des notes par M. de Querlon.* Rome and Paris [Chez le Jay], 1774, vol. 2, p. 97.

† The writer does not know which pope awarded Cardan a pension. The evidence concerning this point is now so confusing that an opinion probably must remain a conjecture.

celeberrimi tot scriptis hominis recordatio subiret, neque tamen quidquam in eo, quod tantae famae responderet, animadverteremus. . . ."

On September 20, 1576,*† at about seventy-five years, died ** the broken, sorrowful old man ‡ of whom Sir Thomas Browne (1605-1682) said,[148] eighty-two years later: "To be content that times to come should only know there was such a man, not caring whether they knew more of him, was a frigid ambition in *Cardan*. . . ."

It has been said [15, 144] that the body of Cardan was interred in the church of Saint Andrew in Rome, and that later it was transported to Milan, where it was placed in the tomb of Fazio Cardan in the church of Saint Mark. This may be so. But one of the most recent Italian investigators [93] of the life of Cardan has written: "Ma della sua tomba non si ha più alcuna traccia, nè in San Marco nè nel chiostro adiacente; cosi pure nulla si sa della discendenza, quantunque sia certo che nel secolo XVII esisteva in Milano un Gerolamo Cardano di professione medico."

* In her translation and commentary of the first book of *De Subtilitate*, Cass made two errors in respect to the year of Cardan's death. First, she referred to De Thou as having written that Cardan died in 1575, and indicated that she herself accepted that year as the year of Cardan's death. Second, in her text she said that Cardan died in 1557. In stating that De Thou gave 1575 as the year of Cardan's death, Cass perpetuated the error of Bayle (reference 24), who wrote of Cardan: "Il mourut à Rome le 21 de Septembre 1575, si nous en croions Mr. de Thou, qui n'a pas été peut-être assez éxact." But as a matter of fact, neither Bayle nor Cass was "assez éxact," because what De Thou (reference 15) wrote was: "Romae magni nominis sive mathematicus sive medicus Hieronymus Cardanus, Mediolano natus, hoc anno itidem obiit," and he was writing of the year 1576—not 1575. See: Cass, M. M.: *The First Book of Jerome Cardan's De Subtilitate*, translated from the original Latin, with text, introduction and commentary. Williamsport, Pa., the Bayard Press, 1934, pp. 12 & 22.

† Cumston's statement that Cardan practiced medicine and died in the city of Berne, Switzerland, is without foundation in fact. See: Cumston, C. G.: *An Introduction to the History of Medicine From the time of the Pharaohs to the end of the XVIIIth Century*. London, Kegan Paul, Trench, Trübner and Co., Ltd.; New York, Alfred A. Knopf, 1926, p. 247.

** In their history of the city of Milan, Verri and Custodi were notably in error when they wrote about the death of Cardan. First, they seemed not to be aware that Cardan died in Rome, rather than in Milan. Second, they thought it at least possible that he had died of the plague that beset Milan in 1576 and 1577. Third, they gave 1577 as the year of his death. Writing of the plague in Milan in 1576 and 1577, they observed: "Verso il principio del 1577, però senza colpa della peste, morì Girolamo Cardano, di settantacinque anni, illustre per il suo sapere, per il suo ingegno e per la sua esimia credulità nelle scienze occulte." See: Verri, Pietro: *Storia di Milano, colla continuazione del Barone* [Pietro] *Custodi*. Capolago, Switzerland, Tipografia Elvetica, 1837, vol. 4, p. 178.

‡ De Thou's silly story (reference 15) that Cardan starved himself to death in order to fulfill his own astrologic prediction as to the date of his death was disputed long ago by Tiraboschi (reference 91). Tiraboschi, noting that De Thou had written that Cardan died in 1576, objected that this would not have fulfilled Cardan's prediction, "perciocchè egli chiaramente ci dice di dover morire o a' 5 di dicembre del 1573 o a' 23 di luglio del 1571 [l. 12 Genitur, n. 8]."

III.

CARDANI AEVUM

It is difficult to express the magnificence of the age of Cardan. Scarcely nine years before his birth there had occurred the discovery of the New World, the "one event, to which the history of the world offers no parallel, before or since . . . ." [145] Cardan's own father had been born almost at the very inception of the art of printing,* the art which at many times was the one solace to which Cardan in his vicissitudes could turn, and the one which has chiefly preserved his name amongst us. Cardan saw the rude and untutored feudal militia transformed into disciplined professional soldiery, and the unlovely countenance of war made still more fearful by the increasing application of gunpowder.† When Cardan was an infant it was the frank ambition of every man of parts to visit one of the Italian universities of the north; before he died there were at least two universities established in the new far-off lands beyond the seas wrenched from the savages by Pizarro and Cortez. During Cardan's lifetime more gold and silver poured unchecked into the great coffers of the Spaniards than the strongboxes of the Venetians and Genoese, swollen with gains from the rich trade of the East, had ever guarded. Cardan witnessed the first faint indications of the ultimate power of France as a nation; while he was still young, France was strong enough to challenge the German princes for supremacy in the Empire: the fact that the Habsburg Charles was elected Emperor over the Valois Francis at Frankfurt in 1519 was due

* Cardan was acute enough to appreciate the tremendous value of the printing press, the mariner's compass and gunpowder. In the opening paragraphs of the seventeenth book of *De Subtilitate* (reference 292) he wrote that the whole of antiquity had nothing equal to these three inventions. Bury erred when he said this statement was to be found in the *third* book of *De Subtilitate*. See: Bury, J. B.: *The Idea of Progress. An Inquiry into its Origin and Growth*. London, Macmillan and Co., Ltd., 1920, p. 40.

† "Gunpowder is still sufficiently awe-inspiring to dominate the military imagination and to hinder the process of sober experiment and methodical tabulation of results by which alone artillery can be progressively improved. The mystery which surrounded the origin of this monstrous birth of the Middle Ages continued to cling to it for two centuries. The practice of gunnery was the jealously kept secret of an exclusive craft. The enlightened Guicciardini can describe artillery as a pest. Even Machiavelli, who, characteristically, pokes fun at the claims made on behalf of gunpowder, is forced to admit the important moral effect of the fear which it inspires. Both these public men, however, lived to see, if not to recognize, the beginning of the change from the mediaeval to the modern view of artillery." See: Taylor, F. L.: *The Art of War in Italy, 1494-1529*. Cambridge, the University Press, 1921, pp. 81-82.

not so much to any genuine universal preference for Charles, but rather, to Charles' generosity with the gold * which Francis lacked, and to the Swabian army of Franz von Sickingen.[146] Cardan visited England in the days before Britons could call their land a prime power, but he died only a few years before the "Italianate Englishmen" of Elizabeth, fighting like the devils incarnate they were supposed to be, toppled Spain from the lists in Europe and laid the foundations for British domination of the high seas.

No less profound were the changes in the things of the spirit. The soft, sweet music of the Greeks, which had reached the shores of Italy long before the Moslem conquest of Constantinople in 1453, turned men in firm persuasion away from the harsh clangor of everything that had been produced between Hadrian and Frederick III. The crabbed pages of writers from Tacitus onward were cast aside in an aversion that stemmed, on the one hand, from the convulsed Latinity of the schoolmen, and on the other, from the insistent attraction of the gorgeous new paganism. Latin itself fell victim to the infant vernaculars.

Cellini, Michelangelo, Borromeo, Alciato, Vesalius, Rabelais, Copernicus, Scaliger, Fernel, Peruzzi, Vignola, Paracelsus, Caius, Tycho Brahe, Luther, Melanchthon, Guicciardini, Bruno, Aldrovandi, Brasavolus, Rondelet—to mention only a few—were some of the great names of the time of Cardan. Thirteen men sat as pontiff in the Eternal City during the lifetime of Cardan; five reigned as Holy Roman Emperor. Cardan was twelve years old when James IV fell mortally wounded at Flodden Field; sixteen when Martin Luther nailed his Ninety-five Theses to the door of the Castle Church of Wittenberg; nineteen when Magellan passed the southernmost reaches of South America; and twenty when Juan Ponce de León died in Havana; twenty-six at the sack of Rome; thirty when Henry VIII became head of the church in England; thirty-five when the *Institutes of the Christian Religion* of John Calvin was published; forty when Solyman the Magnificent captured Buda and made Hungary a Turkish province; fifty when the Turks overran Tripoli; fifty-seven at the accession of Elizabeth of England; sixty-three when Shakespeare was born; and seventy when the Turks were vanquished at the Battle of Lepanto.

It is curious that no one thus far has sought to estimate the effect of the Reformation upon the career of Cardan. The causes and the origins of the Reformation cannot be considered herein; they have been variously

* It is true that the Electors at Frankfurt chose Charles unanimously, but the election cost the Habsburg candidate no less than 850,000 *florins*. See reference 146.

identified as the work of Wycliffe and Huss in advance of the labors of Luther, the Babylonian Captivity, the Great Schism, the ascendancy of national feeling and distrust of foreigners, particularly in Germany and England, the growth of a middle class and a capitalist economy which looked upon the Roman church as a restraint, and the great wealth of the Roman church as a source of enrichment to unscrupulous princes who could obtain it by confiscation. Cardan, still a young man throughout the critical years of Luther's career, saw Calvin introduce the Reformation into Geneva and Knox bring Calvinism into Scotland. The chief agent in the spread of the Counter Reformation was the Society of Jesus, founded in 1534 by Iñigo López de Recalde (1491-1556) when Cardan was thirty-three years old, and approved by Pope Paul III in 1540, when Cardan was thirty-nine. In the same year as that in which the Society of Jesus was formed, the Act of Supremacy was enacted in England, making Henry VIII and his successors the head of the church in England. Cardan's concern at the presence of Lutheranism in Denmark has already been mentioned.[117]

The relationship of the Reformation to Cardan may seem remote indeed. Yet a number of his actions seem explicable on no other basis than his acute realization of his own position as an inhabitant of Italy, the stronghold of the Roman church, in an age in which that institution was forced to fight bitterly for its continued power in many lands. Study of the life of Cardan impresses one with the fact that Cardan never forgot he was an Italian, living in Italy. His aversion toward Denmark probably was genuine, based on his regard for the relatively more pleasant climate and atmosphere of his homeland. Scotland he actively disliked, despite the fact that when he went there he moved in circles firmly bound to the Roman church. In England he found much to admire; but his reactions to King Edward VI and others whom he met there show that he assayed everything in terms of his periphery at home, in Italy, where the authority of the Roman church was supreme. When his treatment of the four principal religions in the first edition of *De Subtilitate* seemed likely to provoke trouble for him, he removed it from subsequent editions. Similarly, when in 1570 he was arrested and later cautioned to write no more, he acquiesced. He went to Rome, as he was advised to do, and there he found honor, patronage and some semblance of affluence. There he also discovered, as has been shown,[78] that he could publish certain writings "Cum licentia Superiorum." What seems apparent is that Cardan recognized the ecclesiastic authority of the Roman church, and was in no wise moved to challenge that authority.

A somewhat similar attitude is reflected in Cardan's behavior toward the French and Spanish. The French invaded his country several times; so also did the Spanish. But Cardan seemed willing enough to bear the canopy of the Spanish sovereign, the Emperor Charles V, when that monarch entered Milan in 1541.[120] Nor did Cardan find the French so repugnant that he could not visit their capital, consult their leading physicians and philosophers, and record with pride various proposals or offers from powerful Frenchmen of his time. Cardan, like other Milanese, must have realized that the city or duchy of Milan, as a state, was powerless when it had to depend upon its own resources. It had no possibilities for either offense or defense excepting as it derived them as a fief of some greater power—France or Spain.* The evidence in Cardan's writings indicates that he had no animosity toward either of the nations which alternately invested Milan—France or Spain—and that he did not wish to fall into a position in which hostility for either side could work against him. Cardan was often unscrupulous, often devious. But he was also exceptionally shrewd. It does not seem to this writer that he could have remained unaware of such great events as the Reformation and the clash between Spain and France in Italy, or that he could have failed to govern his own course of action, in relation to those events, according to his conception of his best interests.

Yet the magnitude of the changes in almost every aspect of human life that occurred during the life of Cardan should not blind one to the defects of some of them. It is now recognized that there had been other—although not nearly so far-reaching—periods of renascence before the Renaissance. It is common for modern scholars to speak of the Carolingian renaissance of the eighth century, during which such men as Peter of Pisa, Paulinus

*"Cardanos engere Heimat, das Herzogtum Mailand, teilte das Schicksal Italiens . . . Das Land war französische Provinz, bis das päpstlich-kaiserliche Bündnis die Franzosen von neuem verdrängte und im Jahre 1522 Mailand als Reichslehen an den zweiten Sohn des Moro, Massimilianos Bruder Francesco Sforza II., fiel (gestorben 1535); in Wirklichkeit herrschte der Kaiser. Es folgten neue französische Feldzüge, die Schlacht bei Pavia (Februar 1525), der kaiserlich-päpstliche Krieg vom Jahre 1526, der mit der Plünderung Roms endete, die französische Invasion vom Jahre 1527 und die Plünderung Pavias; nach der kurzen Ruhe, die der Friede von Cambrai (1529) und die Kaiserkrönung in Bologna (1530) dem Lande gönnten, tobten in den Jahren 1536-1538, 1542-1544 in Oberitalien neue Kriege zwischen Karl V. und Franz I. Das Land litt unsäglich. Epidemien und Teuerungen vermehrten das allgemeine Elend. Die dauernde Unsicherheit der rechtlichen und politischen Verhältnisse, die wirtschaftliche Verarmung und Verödung des Landes, die Barbarei der fremden, vor allem der schweizerischen Soldateska hatten in wenigen Jahren weggefegt, was die Kultur der Renaissance in Mailand geschaffen." See reference 316.

of Aquilea, and Paul the Deacon came into the Frankish kingdom from Italy, Einhard from the German marches, Agobard from Spain, Theodulph of Orléans from the Goths, and Alcuin from York.[147] There was a so-called Ottonian renaissance in the tenth century: men so marveled at the non-Christian erudition of Gerbert of Aurillac, who used Arabic numerals, discoursed on *genera* and *species*, and devised a clock on the principle of the pendulum, that he was believed to consort with Satan.[148] Yet he became Pope Sylvester II. Again, there was a renaissance in the south of France in the twelfth century,[149, 150] and Reade [151] has spoken of "the golden age of translators, which began early in the twelfth century and lasted about a hundred and fifty years."

There are other considerations which must qualify the greatness of the sixteenth century, as well as the one anterior to it. Symonds [152] has pointed out that the Renaissance actually consisted of three parts: "The thinkers of the first stage began by questioning the authority of dogma. Those of the second stage accepted the authority of the ancients. Those of the third appealed to Nature against ecclesiastical and classical authority alike." The return to the classics was, in point of fact, substitution of an earlier authority for a later authority. The earlier masters were the more resplendent, it is true, and their works sublime stuff; but nevertheless, what most of the men of the Renaissance worshipped was an authority that was not their own or even of their making. In the time of Cardan the man who ventured to gainsay the authority of the ancients was as likely to be as savagely attacked as a man who, in an earlier age, had dared to question the tortured logic of the schoolmen. Aristotle and the qualitative method in science had to be dethroned, and ultimately were; but before the Pythagoreans who were chiefly involved in the beginnings of modern science could achieve success, many of them were severely chastised for their temerity by those who still venerated the Aristotelian tradition.

Nowhere was this fact more apparent than in what was at the time known as "natural philosophy." "Not until the revival of Greek studies did men get inspiration from the true masters of science, and for at least two generations they were too busy looking for the fountains to explore for themselves the virtues of their waters." [153] When the *De Revolutionibus Orbium Coelestium Libri VI* of Copernicus was put through the press by Osiander in 1543, that Lutheran mathematician was so fearful the theory of the motion of the earth would offend not only the clergy but the philosophers as well that he inserted a deprecatory preface * of his

* For years it was believed that this preface had been written by Copernicus himself.

own in the work,[154, 155] although a modern critic seems rather inclined to credit this preface to Copernicus and not to Osiander.[156]

Vesalius was bitterly reproached by his own colleagues, even at the Averroistic stronghold of Padua,[157] when he ventured to attack Galen. As late as 1610, at the same university, Galileo was subjected to gross insults for his new teachings, so much so that he wrote to Kepler: "What do you think of the foremost philosophers of this University? In spite of my oft-repeated efforts and invitations, they have refused, with the obstinacy of a glutted adder, to look at the planets or the Moon or my glass . . . Kindest Kepler, what peals of laughter you would give forth if you heard with what arguments the foremost philosopher of the University opposed me, in the presence of the Grand Duke, at Pisa, laboring with his logic-chopping argumentations as though they were magical incantations wherewith to banish and spirit away the new planets out of the sky!" [158]

There are other indications that important work in the sciences was ignored at the time it was carried out, as well as substantial evidence that much scientific work that was poorly conceived and executed found its way to the printing presses. Thorndike [159] has listed several somewhat important sixteenth-century works that were not printed until years after the death of their authors, remarking: "Such posthumous publication, sometimes long delayed, is a fairly sure sign that ideas were not changing much or science progressing." This is an important observation, for it tends to refute the common impression that the return to the classics in literature and art was accompanied by a similar action in science. Singer [160] has written: "In the processes of recovery of the classical originals the attention of scholars was first directed to works of literary merit. Scientific treatises appealed to a much smaller audience, and moreover, few scholars were adequately equipped to deal with them. Thus the revival of classical science came later than the revival of other sections of classical literature . . . The humanists as a class exhibited little sympathy with the scientific outlook. Their interests were literary; their peculiar aversion was the Arabist tendency of the age that they were leaving behind." Sarton [161] showed that the scientific incunabula, for the most part, "did not diffuse so much objective and rational knowledge, as superstitions, especially in the form of judicial astrology." He thought the incunabula literature was medieval in character, "retrograde rather than progressive." [161] Klebs' survey [162] of 1938 tends to substantiate such a view.

Not until 1597 did Johann Kepler (1571-1630) demonstrate that the preface was the work of Andrew Osiander (1498-1552).

When such a man as Cardan arises, who was aware of the classic past but was by no means fettered by it, it is of value to try to discover the men of his own age whom he knew and those who might have influenced him. Many of them are mentioned in the forty-eighth chapter [65] of his *De Propria Vita Liber*. Others are referred to in different parts of the same work and in various longer works of Cardan. Generally, it is difficult to identify those men who exerted an effect upon him during the earlier part of his career. It does not appear that he remembered many of the eminent men he must have encountered at the University of Pavia, although it should be recalled that he did not complete his education at Pavia. Moreover, the University of Pavia never attained to the fame of Bologna or Padua in the sciences.

Yet Pavia, the place where Cardan first came into contact with university savants, was of worthy name. It has been said [163, 164] that Pavia first obtained a *studium generale* by virtue of a charter conferred by the Emperor Charles IV (1316-1378) of Luxemburg at Nuremberg on April 13, 1361. This statement should be tempered by caution such as Haskins [165] has displayed: ". . . the beginnings of the oldest universities are obscure and often uncertain, so that we must content ourselves sometimes with very general statements." A contention like that of Mengozzi,[166] for instance, seems too sanguine: "Il germe sostanziale dell'università è nato e creato a Pavia e origine pavese ha il diploma di laurea" and "[Pavia] possa vantare una scuola che continua ininterrottamente dall'epoca romana a quella communale e che rivela un cammino ascensionale meraviglioso . . ."

Boethius (*c.* 480-524) wrote his *De Consolatione Philosophiae* in the town of Pavia before he was executed most cruelly there by Theodoric of the Ostrogoths; in 996 the Emperor Otto III (980-1002) had the mathematician's bones removed to the Church of San Pietro d'Oro in Pavia. Ugo Benzi (*c.* 1370-1439), known also as Hugh of Siena and as Ugone de Benciis, once taught at Pavia.[167] Famous as both dialectician and physician, he is remembered for the fact that as early as 1429 he had carried out necropsy of a human body.[168] Marsilio di Santa Sofia, important as an early opponent of scholasticism, and considered an Averroist by Renan [169] and as a great master of medicine by Michele Savonarola,[170] had taught at Pavia.[167] Sabbadini [171] said that Lorenzo Valla (*c.* 1406-1457) was at Pavia from 1430 to 1433;* † it has been said, too, that

* It seems likely that Antonio Beccadelli (1394-1471) or "il Panormita," author of the scandalous *Hermaphroditus*, was at Pavia in 1430 or 1431. See: Tilley, A. A.: The

Columbus (*c.* 1446-1506) studied at Pavia, but there apparently [172] is no real basis for such an assumption, even though some of his ashes are said to be preserved in the library of the university. The devoted Arabist, Gianmatteo Ferrari de Grado (d. 1472), who wrote a commentary on the ninth book of Almansor that was first printed in Paris in 1471 and which was the subject of a study by Klebs [173] in 1924, was a Pavian who seems to have been the first to apply the term " ovary " to the female gonad.

Yet the traditional background at Pavia was not scientific. Both D'Irsay [164] and Denifle [174] agreed that for years the university was devoted to juridical studies and literary and philologic humanism. At the time Cardan attended the University of Pavia the medical school did not compare with that of Bologna, for example, and Bologna itself was by no means the finest medical school in Italy in that age.

This contention is supported, at least in part, by the men whom Cardan knew at Pavia: none, save possibly one, is remembered in the history of science or medicine today.

The single exception is Matthaeus Curtius (1474-1544), said to be so erudite " that in all the universities of Italy he ranked first in interpreting and disputing." [175] Curtius taught logic at Pavia in 1497 and 1499, and was listed as a promoter to a degree at that university in 1512.[175] In 1515 he was at Pisa, and from 1524 to 1532 he taught the theory of medicine at Padua.[175] He died at Pavia in 1544. In that year Cardan was a professor at Pavia.

Cardan said [176] he envied Curtius for his love of books, but not for his erudition. Curtius must have been at Pavia in 1522, for Cardan wrote [177] that Curtius had honored him by consenting to engage him in debate when he (Cardan) was twenty-one years old: " . . . anno xx. fermè exacto ad Academiam Papiensem me contuli, xxi. in fine disputavi sub Curtio Medicinae primario, qui me dignatus est honore argumentandi, cum nil

Early Renaissance. In: *The Cambridge Medieval History.* New York, the Macmillan Co., 1932, vol. 7, pp. 751-766.

† Another legend in respect to the University of Pavia is represented in Portal's statement that Albertus Magnus (1193-1280) studied at Pavia. Portal wrote: " L'éducation qu'il [Albertus] reçut répondit à l'éclat de sa naissance. Il fut envoyé pour faire ses études à Pavie, où ayant entendu un fameux Prédicateur, il fut si touché de son sermon qu'il forma la résolution d'entrer dans l'Ordre des Dominicains." See: Portal, Antoine: *Histoire de l'anatomie et de la chirurgie.* Paris, P. Fr. Didot le Jeune, 1770, vol. 1, pp. 194-195. Tiraboschi, however, denied this assertion, saying that Albertus actually had studied at the University of Padua, and that Portal's claim was typical of those of persons who sought by such means to prove the antiquity of the University of Pavia. See: Tiraboschi, Girolamo: *Storia della letturatura italiana.* Venice, 1795, vol. 4, book 1, p. 45.

tale ab eo sperare ausus essem." Again, he listed [65] Curtius as one of his enemies, and seemed to take pleasure in the fact that after he (Cardan) once had debated in Padua in 1524, the governor * of that city said to him: "Stude ô iuvenis, quoniam Curtium superabis . . ." [65] It seems that Cardan was impressed, not by the learning of Curtius, but by the great name the man enjoyed in the Italy of his day.

Curtius undoubtedly was a famous man in his time. He was the author of a work on human anatomy,[178] and was much sought after as a physician. He was one of the physicians of Pope Clement VII (1480?-1534), but recent investigation by Gualino [179] suggests that Curtius' services in this respect were not particularly laudable. Speaking of the several physicians who had attended Pope Clement, Gualino [179] wrote: ". . . s'incolpò sovratutti il galenico Matteo Corti, sia ch'egli invertisse le radicate consuetudini del Santo Padre prescrivendogli una cena più lauta del desinare, sia che propinasse una pillola di rabarbaro proprio quando l'infermo rinsanava in virtù della quinta essenza per lui da un certo frate di San Grisogono appositamente lambiccata. E la statua di Pasquino echeggiava pur essa a questa micidiale imperizia del disgraziato sanitario:

> Curzio uccise Clemente; a lui dovute
> son ricche offerte, a lui che ci diè in dono
> la pubblica salute." [179]

Another enemy of Cardan at Pavia [65] was a man named Delfino (possibly Giulio Delfino of Mantua, who died in 1564). Cardan mentioned [120] Delfino as one of the professors at Pavia who tried to force him to resign from the university in 1562. At one point [120] Cardan called Delfino a "wolf," but at another [65] he said that Delfino once had spoken most handsomely of him. The Delfino in question certainly was not Federigo Delfino (d. 1547), who succeeded Thomas Philologus as professor of mathematics at Padua in 1521, because Federigo Delfino prior to his appointment at Padua had practiced medicine in Venice for fifteen years, and after the appointment taught at Padua until he died in 1547. Hence, he could not have been a member of the faculty at Pavia when Cardan

* The "governor" was Sebastiano Giustiniano. Orsato wrote that he was *podestà* of Padua in 1525, not 1524. This was confirmed in 1861 by Gloria, who said that Giustiniano served as *podestà* of Padua from the middle of May, 1525, to the middle of June, 1526. Cardan probably forgot the exact year, as he did in other instances. See: Orsato, Sertorio: *Cronologia delli reggimenti di Padova da quando vi fù introdotta la pretura sino al giorno d'oggi.* Padua, Heirs of Paolo Frambotto, 1666, p. 57. See also: Gloria, Andrea: Serie dei podestà e capitani di Padova dal 1509 al 1797. *Revista periodica dei lavori della I. R. Academia* [sic] *di scienze, lettere ed arti in Padova* 9 (part 1): 137-244, 1860-1861.

was there. Nor was Cardan's enemy Domenico Delfino, whose *Sommario di tutte le scienze* was published in Venice in 1556 and again in 1565.[180] The surname, Delfino, was a famous one in northern Italy, and especially so in Venice.

Still another enemy of Cardan at Pavia was Andrea Camuzio (?-1578) of Lugano.[65] There was good reason for animosity between the two men, for Camuzio was a Galenist, which Cardan certainly was not. Camuzio went so far, according to Cardan,[65] as to have a book printed in which he complained that at Pavia the name of Cardan was cited as an authority superior to that of Galen. This may be the book [181] to which Dayre [182] referred in 1936, in his translation of the *De Vita Propria Liber*. Cardan related [183] with obvious satisfaction that he had once debated with Camuzio before the Senate at Pavia, in what had been planned as a three-day disputation. Cardan, however, defeated Camuzio on the first day, in the first proposition.

Branda Porro of Milan, professor of philosophy and later of medicine at Pavia, was Cardan's preceptor.[183] Cardan seems to have had no serious disagreement with Porro, but he once corrected him, during an informal debate, on a garbled quotation from Aristotle. Cardan had made the correction from memory; Porro, furious, sent for the volume in question, only to find that Cardan was right. The encounter reached ears of members of the Senate at Milan, and probably did Cardan no harm.[183]

The staunchest friend of Cardan at Pavia must have been the great Italian jurist, Andrea Alciato (1492-1550 or 1552), uncle of Cardan's friend and protector, Cardinal Francesco Alciato (1522-1580), secretary to Pope Pius IV (1499-1565) and advocate of the candidacy of Cardan to the chair of the theory of medicine at Bologna in 1562. The elder Alciato was zealous in his advancement of the interests of Cardan; he read Cardan's works daily, and in particular, *De Consolatione*.[65] He was accustomed to call Cardan the "man of discoveries," and Cardan himself said [65] that Alciato had been the first to recognize his (Cardan's) greatness.* Cardan said [184] he first met the jurist at Pavia,† and by association,

*Cardan's life of Alciato is to be found on pages 569 and 570 of volume 9 of the *Opera Omnia*.

†The University of Bologna also claims Alciato: "Con la partenza del Parisio il Reggimento, vincendo le opposizioni del Governo di Milano, riusciva a coprire la cattedra eminente pomeridiana col più geniale dei giuristi italiani del secolo, Andrea Alciato (1537-41), che lasciava lo Studio di Pavia sua patria. Con lui sulla cattedra bolognese non saliva solo un maestro geniale, ma il rappresentante di un metodo nuovo, che, al di sopra delle glosse e dei tradizionali commenti, cercava di far capire gli antichi istituti nel quadro della loro epoca storica, giovandosi di una larga coltura di letteratura e di

implied that the nephew, Francesco Alciato, likewise had been a professor at Pavia. Verri and Custodi [185] wrote that Andrea Alciato had lectured at the school founded in Milan by Tommaso Piatti during the time of Ludovico Sforza (1451-1508). This was the school at which Cardan himself had lectured on geometry and astronomy in 1534. The same authors [185] said that Alciato died in Pavia in 1550, and that an impressive monument of marble was erected for him at the University of Pavia.

Finally, a man who does not figure at all in the history of science must be set down as an exceptionally close friend of Cardan at Pavia. He was Gian Pietro Albuzio (1508-1583), professor of rhetoric in the university.[184] It was to Albuzio that Cardan turned in 1560 for comfort, after his son, Giambattista, had been executed in prison. Albuzio could not have contributed to the scientific career of Cardan, but he must have known the Milanese physician as intimately as any man of the time.

But it was at the University of Padua that Cardan took his baccalaureate and his doctorate, and in the time of Cardan, as well as before, Padua far outshone Pavia in the sciences. Padua had had a studium generale as early as 1222,[186] when, it has been said,[187] " Assai maggiore fu il danno che l'università di Bologna sostenne l'an. 1222, perciocchè ella vide non solo un gran numero di professori e di scolari fuggir dal suo seno, ma recatisi altrove dar principio a un'altra celebre università che minacciava di disputarle il primato. Fu questa la università di Padova." In mathematics alone Padua had given Cardan such predecessors as Leonard Fibonacci (1170-1240) of Pisa, whose Abacus was called [188] the first complete treatise on algebra written by a Christian, and who was supposed [189] to have introduced Arabic or Indian numerals into Italy; Michael Scot (*c.* 1175-*c.* 1233), whose " translations of Averroës were among the first works of that heresiarch available to the Latins "; [190] Witelo (b. 1230?) the Silesian, studied canon law at Padua from 1262 to 1268 and wrote on optics and perspective; [191] Nicholas of Cusa (1401-1464); Paolo dal' Pozzo Toscanelli (1397-1482), who may [192] or may not [172] have furnished Columbus with information and a map for the journey to the New World much later; Georg von Peurbach (1423-1461); Regiomontanus (1436-1476); Georgius Valli (1430-1499); Prosdocimo de' Bel-

antiquaria. Era la nuova scuola storica del diritto in contrapposizione al cosiddetto *mos italicus* a cui la pigra tradizione locale voleva rimanere legata. Ma, finito il quadriennio, il Governatore di Milano costrinse l'Alciato a tornare a Pavia. . . ." See: Simeoni, Luigi: *Storia della Università di Bologna.* Bologna, Nicola Zanichelli, Publisher, 1940, vol. 2, p. 40.

domandi (d. 1428); Marianus Socinus (1401-1467); and Nicoletus Teatinus (d. 1499).

It was at Venice, powerful protector of Padua, that trigonometry was first applied to nautical science, and that the decimal division of the radius and the theory of tangents were developed;[193] at Venice the first commercial arithmetic text of considerable importance and influence—although not the first printed arithmetic[194]—was printed:[195] the *Nobel opera de arithmetica* of Pietro Borghi (d. after 1494). At Venice the double-entry system of bookkeeping came into being.[196]

" Aux universités de Bologna et de Padoue, la chaire d'astrologie était considerée comme l'une des plus nécessaires . . . ,"[197] and it seems certain enough that Cardan, who guided many of his own actions and also advised others according to the results of his astrologic calculations, was not indifferent to the attractions of the art as taught at Padua. Peter d'Abano (1250-1316), " the Marvelous Lombard ";[198] Alberico da Rosciate (d. 1534);[199] Marcantonio Zimara (1460-1523 or 1532);[200] Blasius of Parma, " most famous doctor and monarch of all the liberal arts ";[201] Sicco Polentone (d. 1463);[202] and many others skilled in astrology had learned the art at Padua or had taught it there, long before Cardan went to the university in 1524.[99]

Padua was remarkable in other respects in that age. It will be recalled that Cardan had gone to England and Scotland in the year 1552.[12, 125, 126] Long before he set forth on that remarkable journey, Englishmen had been coming to Padua in appreciable numbers. Osler[203] said that John Free or Phreas (d. 1465) was the first English scholar to go to Padua,* and it is known that Free actually taught at the Italian university. John Tiptoft, Earl of Worcester (1427-1470), " the fierce executioner and beheader of men,"[204] was another; he studied Latin at Padua and became so proficient in that language that men said he caused Pope Pius II to weep with joy that an Englishman could be so eloquent in a foreign tongue.[205] Thomas Linacre (1460-1524), intimate friend of Lorenzo de' Medici (1449-1492),[205] was graduated from Padua, probably in 1490.[206] He was credited by Erasmus[205] with having introduced medicine into England, and is known to have been responsible for the founding of the Royal College of Physicians.[206, 207] Cuthbert Tunstall (1474-1559), bishop of London and Durham, English ambassador to the court of the Emperor Charles V, and author[208] of " the first book wholly on arithmetic

* He probably was not. For a modern appraisal of Osler, in part as a historian, see: Greenwood, Major: *The Medical Dictator*. London, Williams and Norgate, Ltd., 1936, pp. 145-170.

that was printed in England," [209] took the degree of doctor of laws at Padua. Cardinal Reginald Pole (1500-1558) was sent to Padua to study in 1519 by King Henry VIII (1491-1547) of England, and was there again in 1546 and 1547. Richard Pace (d. 1532), secretary of state of England in 1516, studied at Padua.[210] So also did John Chambre (d. 1549), physician to Henry VIII,[206] and John Clement (1490-1572), a scholar-physician and persistent Roman Catholic in an age in which it was not easy to be such in England. Clement was at Padua about 1521.[206]

Two of the greatest English physicians who studied at Padua during the age of Cardan were not mentioned by the Milanese. The first was Edward Wotton (1492-1555), who took the degree of doctor of medicine at Padua after he had served as professor of Greek at Corpus Christi College in England. He is sometimes called the first English zoologist, and he served as president of the Royal College of Physicians.[206] The other man was John Caius (1510-1573), nine years younger than Cardan; he came to Padua in 1539 and took his doctorate in medicine in 1541. He studied under Giovanni da Monte or Montanus (1498-1552), and lived in the house of Vesalius while he was at Padua.[211] He returned to England to become physician to the sickly Edward VI (1537-1553), and he also served in such a capacity to Mary (1516-1558) and Elizabeth (1533-1603). His only intimate friend was Conrad Gesner (1515-1565), whom Cardan knew and visited on his way home to Milan from Edinburgh and London in 1552. It is inviting to speculate that Cardan saw Caius while he was in England, but such a thought must remain speculation only.

There is no doubt that Cardan knew of one of the most celebrated of all Paduans: the Fleming, Andreas Vesalius (1514-1564). Cardan spoke of his esteem for Vesalius at least once,[184] saying that the Fleming was the foremost anatomist of his day. In two other places [99, 137] Cardan specifically referred to the part Vesalius had played in the offer of the post of physician to King Christian III (1503-1559) of Denmark in 1547, and in one of them [99] he spoke of Vesalius as his friend. On the other hand, in the *De Libris Propriis* there is a passage [212] in which Cardan intimates that he never had met Vesalius: " Brasavolum, ut qui Ferrariensis esset, Ferrariae moraretur, nunquam vidi: ut neque Vesalium, quamquā intimum mihi amicum." Cushing [213] has shown that Vesalius was chosen professor of surgery at Padua on December 6, 1537.* At this time Cardan

* It is curious that so careful a critic as Henry Hallam (1777-1859) should make the error of saying that Vesalius " in 1540 became professor of the science [anatomy] at Pavia." See: Hallam, Henry: *Introduction to the Literature of Europe, in the Fifteenth, Sixteenth, and Seventeenth Centuries.* London, John Murray, 1840, vol. 1, p. 640.

was living in Milan. Ten years later the second edition of a minor work [214] by Cardan was printed; in this work is found the horoscope of Vesalius as cast by Cardan. It is this horoscope which is the basis for the determination of the year of Vesalius' birth as 1514; had the horoscope not been cast, this particular point might still be surrounded by conjecture. But this horoscope does not appear in the first edition of the little book by Cardan, printed in 1543.[59] Hence, at some time after 1543, but before 1547, Cardan became sufficiently interested in Vesalius to cast his horoscope. As has been said,[117] Vesalius in 1547 asked Cardan to become physician to the Danish monarch. It will be seen, then, that at the time Vesalius extended this offer and the horoscope of Vesalius by Cardan appeared, the great work of each man already had been published: the *De Humani Corporis Fabrica Libri Septem* [76] of Vesalius in 1543, and the *Ars Magna* [71] of Cardan in 1545. The suggestion is not made here that Cardan became interested in Vesalius because he had read the Fleming's great work on anatomy, but as Castiglioni [61] has written: "Certamente il Cardano conosceva l'opera dell'immortale anatomico, maestro a Padova, ove egli aveva compiuto i suoi studi: certo era un ammiratore dell'uomo illustre, del quale già correva la fama per tutta Europa, perchè centinaia di studenti da ogni parte del mondo accorrevano alle sue lezioni. Il Vesalio era infatti uno degli uomini dei quali più si parlava nelle scuole mediche d'allora." Thus far the relationship of Cardan to Vesalius has not been definitely determined; but it seems significant that both displayed the same indifference to traditional authority, and that both were subjected to bitter attacks in the universities in which they taught, largely because they refused to be fettered by the ancients.[61]

It is curious that Cardan succeeded a Paduan at the University of Bologna in 1562, and that when he was dismissed from Bologna in 1570, the Bolognese attempted, without immediate success, to obtain the services of another Paduan to fill the vacant chair. The man whom Cardan succeeded at Bologna in 1562 was, as Costa [45] has shown, Benedetto Vittori (d. 1561). It does not seem possible that Cardan could have known Vittori at Padua, since Vittori was at Bologna during the years in which Cardan was a student at Pavia and Padua. From 1503 to 1531 Vittori was a lecturer in logic, philosophy and, later, in the theory and practice of medicine at Bologna. In 1531 he accepted the first chair of medicine at Padua, but in 1535 an attempt was made by the Bolognese to bring him back to Bologna. Vittori stayed at Padua until 1538. In October of 1539 negotiations were completed by which Vittori returned to the Uni-

versity of Bologna as professor of the practice of medicine at 700 gold *scudi* annually; in 1541 or 1542 he became professor of the theory of medicine, a post which he occupied at his death on February 12, 1561.[45] Vittori apparently is not important in the history of medicine in the Italian peninsula, although he probably was a notable figure in his own age. Yet Cardan did not mention him when he spoke of his tenure at the University of Bologna.*†

The man the Bolognese wished to succeed Cardan at Bologna was Girolamo Mercuriale (1530-1606) of Forlì. Cardan was imprisoned in Bologna in 1570. " Per la cattedra del Cardano i Bolognesi ricercarono l'anno appresso [1571] Gerolamo Mercuriale," Costa [45] wrote, " ma non riuscirono ad accordarsi con lui nella misura dell'onorario." For that reason, Mercuriale did not go to Bologna at the time, although he did become a professor there in 1587.[45, 215] He is remembered today for his work [215, 216, 217] in what is now a part of physical medicine, and there is evidence, as adduced by Chiadini [218] in 1909, that he did pioneer work in the study of rabies. Cumston [219] has said that Mercuriale had been directed officially to investigate the plague which visited Venice in 1575 and Padua in 1576. If this is so, it would suggest that in those years Mercuriale was still at Padua.

The teachers of Cardan at Padua are known to us because Cardan himself mentioned them.** One of them was Girolamo Accoramboni (1469-

* The famous Giulio Cesare Aranzio (1530-1589), for whom the *corpora arantii* of the aorta and pulmonary arteries are named, certainly was a contemporary of Cardan at Bologna. Martinotti (reference 272) has shown that in 1560 Aranzio had been a lecturer on anatomy and surgery at Bologna for four years, and that Aranzio remained at Bologna as professor of surgery until his death on April 5, 1589. But Cardan does not mention this celebrated Bolognese.

† It has been said that Cardan's enemy, the polemist and philologist, Julius Caesar Scaliger (1484-1558), had received the doctorate in medicine at the University of Padua. But the writer does not know that this is so.

** A celebrated Paduan physician and professor not mentioned by Cardan was Bernardino Speroni (1460?-1528), father of the famous Paduan man of letters, Sperone Speroni (1500-1588). Bernardino began to lecture in medicine at Padua in 1498, went to Venice when the University of Padua was closed in 1509 because of the War of the League of Cambrai, and was called to Rome in 1519 to become a physician to Giovanni de' Medici (1475-1521), who served as Pope Leo X from 1513 to 1521. When the pontiff died, Bernardino Speroni returned to the University of Padua and to his chair of medicine. His name is recorded, during the years 1522 to 1527, as the promoter of several students for the doctorate. He retired in 1527. Thus, he was at Padua during Cardan's period of study there. See: Fano, Amelia: Notizie storiche sulla famiglia e particolarmente sul padre e sui fratelli di Speroni degli Alvarotti. *Atti e Memorie della R. Accademia di Scienze, Lettere ed Arti in Padova* 23 (new series): 205-254, 1907.

1537), professor of the practice of medicine;[177] another was a man nicknamed *Memoria*,* identified by Dayre[220] as Francesco Vettori (d. 1528), professor of medicine. He is not to be confused with Benedetto Vittori (d. 1561), mentioned *supra*, whom Cardan succeeded at the University of Bologna in 1562. Still another teacher of Cardan at the University of Padua was Matthaeus Curtius (1474-1544), mentioned previously as being associated with Cardan at Pavia. Cardan certainly knew Francesco Bonafede,† lecturer in materia medica at Padua, who in 1545 established at that university the "celeberrimo Orto Botanica, primo in Italia ed in Europa."[221] But Cardan wrote that although Bonafede had displayed kindness toward him, he had not attended Bonafede's lectures at Padua.

Antonio Francanzano (d. 1569), "detto l'Esculapio del suo tempo,"[215] was a man well known to Cardan, for the Milanese physician had humbled Francanzano at the University of Bologna. Francanzano at the time was professor of the practice of medicine.[183] Cardan took occasion to correct him, as he had others, for misquotation of a passage in Greek before a group of students. It appears that Francanzano never forgave Cardan. He soon resigned his professorship and removed, as has been shown,[215] to the University of Padua, where he died in 1569.[215] His post at Padua was given to Girolamo Mercuriale, who had obtained the doctorate there in 1555.[215]

At one point in the *De Vita Propria Liber* Cardan[65] wrote that it once had been said that if he should leave the University of Pavia, Montano would take his place. The exact phrase is: "Aliud fuit à Delfino qui mihi concursor secundo loco erat, coram discipulis, & in foro coram me, dicenti cuidam, si ego discederam, Montanum venturum primo loco . . ."[65] This passage has led most commentators on Cardan to assume that the person referred to was Giovanni Battista Montano or da Monte (1498-

* Because of his prodigious memory.

† Encinas wrote: "La cátedra de materia médica sufre una de las más interesantes transformaciones. Al principio fué teórica. Conocida la dificultad de dictarla en esta forma, se juzgó coveniente crear el jardín botánico. A Padua le corresponde este honor antes que a cualquier otra ciudad europea. Francesco Buonafede que enseñaba *Ad lecturam Simplicium*, así denominado el curso, propuso il año 1533 al Senado Véneto la creación del *Horto*. Cuando el estudio de botánica adquirió mayor radio de acción, entonces la primitiva cátedra se dividió en *Ostensionem Simplicium* que era el estudio de botánica; y *Lecturam Simplicium* que trataba del estudio de los productos naturales. La primera se dictaba en el jardin y la segunda en el local de la Universidad." See: Encinas, J. A.: *Historia de las Universidades de Bolonia y de Padua*. Santiago de Chile, Biblioteca Pedagogica [Editorial Ercilla], 1935, p. 153.

1552), famous for his part, at Padua, in restoring the teaching of clinical medicine at the bedside of the patient. The writer does not know that such a contention can be sustained. It would not seem so, after careful inspection of the life of Montano by Cervetto [223] and the monograph by Montesanto [223] on the origin of clinical medicine at Padua. Cardan's phrase would at least imply that when the remark was made, Montano was already at the University of Pavia. Such a situation does not seem likely.

A good friend of Cardan was Guglielmo Gratarolo (1516-1568) of Bergamo, a Paduan who turned Protestant and fled to Basel in 1551 or 1552, so that he might be able to follow his new faith without peril. Of Gratarolo it was written: [224] "No one man in the sixteenth century did more to circulate and to perpetuate a varied selection of curious works, past and present, in the fields of medicine, natural science and occult science . . ." When Cardan was returning to Milan from Scotland in 1552, it seems,[127] he decided to stay overnight at a hostelry in Basel, and would have done so if Gratarolo, a resident of the city, had not warned him that the building was seething with the plague. Cardan was grateful, and the two remained friendly until the death of Gratarolo in 1568. Gratarolo referred to the works of Cardan constantly in his own writings.[65, 224] The friendship of these two men is the more curious when it is recalled that Cardan was, ostensibly at least, a firm Roman Catholic. As has been said, Cardan in London in 1552 refused to acknowledge King Edward VI (1537-1553) as *Fidei Defensor*,[127] and the Milanese physician certainly was considered to be devout enough to merit a pension from the Papacy.[99]

If, as Thorndike [224] wrote, Gratarolo was forty-five years old in 1561, he would have been born in about 1516. He could not, therefore, have been a student at the University of Padua when Cardan was there in 1524, 1525 and 1526. Neither could he, as has been affirmed,[224] have studied under Pietro Pomponazzi at Padua, since Pomponazzi died in 1525. But there seems to be no doubt that Gratarolo attended the University of Padua.

Gratarolo probably was well able to advise Cardan as to the rigors of travel, for it has been shown [224] that Gratarolo was the author of a book containing magical and medical advice for travelers. His unusual interests are reflected in his *Rule of Health for Men of Letters and Magistrates.* He also wrote on balneotherapy, the past, wine, poisons, weather prediction, and physiognomy.[224]

Giovanni Montesdoca [220] (d. 1532) was a teacher of Cardan at the University of Padua whom Cardan identified [177] only as a very celebrated Spanish philosopher. It has not been possible to learn more about this man.

To the foregoing men, whom Cardan actually knew personally, can be added those of his own time who wrote about him or at least mentioned him in their works. There never has been any doubt as to who they were, for Cardan listed them in the forty-eighth chapter [65] of the *De Vita Propria Liber*. One of them was Conrad Gesner (1515-1565), highly skilled in botany, zoölogy, medicine, surgery and philology, whose twenty-volume *Bibliotheca Universalis* was printed at Zürich between 1545 and 1549. Cardan visited him on his return to Milan from Scotland in 1552.

Another was the German Hippocratist, Leonhard Fuchs (1501-1566), professor first of philosophy and then of medicine in Ingolstadt, whose great *De Historia Stirpium*, with 500 magnificent plates, was printed at Basel in 1542. Still another was Caspar Peucer (1525-1602) of Wittenberg, the German physician and mathematician who was the son-in-law of Philip Melanchthon (1497-1560).

Others were Jerome Monteux, physician to King Henry II (1519-1559) of France; Jacques Peletier (1517-1582) of Le Mans, astrologer and physician to Marshal Charles de Cossé de Brissac (1505-1563), governor of Piedmont; João de Barros (1496-1570), the Portuguese historiographer, well known for his history of the East Indies; Jacques Charpentier (1524-1574), of the University of Paris, mathematician and physician to King Charles IX (1550-1574) of France.

There were Philip Melanchthon (1497-1560) of Wittenberg, the famous Protestant educator, theologian and friend of Luther; Reiner Solenander (1524-1565); the polygrapher, Jean Brodeau (1500-1568) of Tours; Guillaume Rondelet (1507-1566), the naturalist; Adrian Turnèbe (1512-1565), hellenist and professor of literature in the University of Toulouse; Valentine Nabod (1527-?), astrologist and professor of mathematics in the University of Cologne, who died or was murdered at Padua; * Gemma Frisius (1507-1566), the Hollander who became

* Curiously, the fame of Cardan may have contributed to the death of this luckless man. Professor Thorndike wrote that Nabod "came to Padua and set to work to outdo the commentary of Cardan on the *Quadripartitum* [reference 317] of Ptolemy. Fearing, however, death from steel, which had been indicated by astrological directions, he rented an undesirable house and locked himself up in it with a supply of food and utensils but no servants. When the landlord came to collect the rent and could not enter, he induced the town authorities to break down the door, and the body of Nabod was found, evidently murdered." This recital is based on an account by J. P. Tomasini in his *Illustrium*

professor of medicine in the University of Louvain and was one of the consulting physicians to the Emperor Charles V (1500-1558); and Amatus Lusitanus (1511-1568?), Portuguese *marrano* and professor in the University of Ferrara.[225, 226]

Had Cardan lived a quarter of a century longer, he would have read sharp and repeated criticism of his philosophy and method by one of the most brilliant Englishmen of the sixteenth century: William Gilbert (1540-1603) of Colchester, personal physician to Queen Elizabeth (1533-1603), fellow of Saint John's College, Cambridge, and president of the Royal College of Physicians. His *De Magnete*, published in London in 1600 and considered by some to be the first major original contribution to science printed in England, contains several references to the works of Cardan. Most of the allusions are frankly disapprobatory, ranging from what he thought was a gross blunder [227] in Cardan's method (in *De Proportionibus*) for determination of the distance of the center of the earth from the center of the world through the variation of the magnetic needle over 9°, to a particularly vehement denunciation [228] of the ninth book of *De Rerum Varietate*: ". . . ut dij tandem malè perdant huiusmodi fictos, & furatos, & deformatos labores, quibus studiosorum mentes perstringuntur." When it is remembered that Gilbert collected information from a multitude of written sources * for use in *De Magnete*, it is not surprising that he should have studied the works of Cardan.† But, remembering likewise Cardan's mastery of invective and disputation, it is inviting to speculate as to what his reactions to Gilbert's attacks

Virorum Elogia Iconibus Exornata, published at Padua in 1629 and 1630. See: Thorndike, Lynn: *A History of Magic and Experimental Science*. New York, Columbia University Press, 1941, vol. 6, p. 122.

* These sources are analyzed, to some extent, in a recent paper by Professor Chapman, of the Imperial College of Science and Technology of England. See: Chapman, Sydney: William Gilbert and the Science of His Time. *Nature* [London] 154: 132-136 (July 29) 1944.

† Sir Walter Langdon-Brown wrote of Gilbert that "In the next year [1570] he terminated his twelve years of residence in college and went abroad, travelling in Italy for three years. Not much is known of this, but from his writings it would appear that he drew inspiration from such medical men as Cardan, Fallopius and Fracastoro." In 1570 Cardan was in Bologna, and was about to become involved in the difficulties which finally resulted in his imprisonment. Since both Fracastoro and Fallopio died before 1570, it may be inferred that Sir Walter Langdon-Brown similarly did not mean to suggest that Gilbert actually saw Cardan. Sir Walter wrote that Gilbert returned to England in 1573, and that all the three years of travel were spent in Italy. See: Langdon-Brown, Walter: William Gilbert: His Place in the Medical World. *Nature* [London] 154: 136-139 (July 29) 1944.

would have been. Turnèbe he called a fool;[65] Scaliger and Solenander, he said,[65] had attacked him only to make names for themselves; Brodeau, Fuchs, Charpentier and Rondelet, he declared,[65] were so ignorant that he could not perceive by what piece of impertinence they had gotten themselves into the ranks of the learned. There is no reason to suppose that Gilbert would have come off more lightly at the hands of the Milanese.

These were only a few of the men outside Cardan's native land who had known of him and had read his works sufficiently to be able to refer to him in their writings. Holland, Germany, France, England, Switzerland and Portugal all were represented by these men. When the formidable obstacles to ready communication in Europe are considered, as well as the technical imperfections and immense physical demands of the printing process of that age, it is realized that Cardan actually must have exerted considerable influence on scientific and philosophic thought of the sixteenth century,* as Thorndike[64] has maintained. The writings of the contemporaries of Cardan show that his fame during his own lifetime had extended far beyond the confines of his native country: a condition which no other man would have cherished more than Jerome Cardan.

* One curious work by Cardan was printed at least twice in the seventeenth century. This was *Proxeneta, seu de Prudentia civili.* It was translated into French; the edition examined by the writer is the second edition, printed in 1652. The complete reference is: *La Science du monde, ou la Sagesse civile de Cardan. Seconde Edition. Divisée par chapitres.* Paris, Antoine de Sommaville, 1652. Pp. 467.

IV.

JUDICIUM DE EO

Platitudes can be uttered and perpetuated by the learned as well as by the unlettered. In the lecture halls of our time the statement that "the Dark Ages were not dark" has been repeated so often that we must now take care to assess the dangers of overemphasis. Similarly, the wry anachronism, "the Holy Roman Empire was not holy, or Roman or an empire," has been projected from so many lecterns that multitudes of uncritical auditors now accept the extravagance of the sally in its widest sense, without inquiry into the very sharp limitations which give such a statement even the semblance of validity.

He who has studied Cardan cannot venture far without being admonished by platoons of commentators that Cardan did not solve cubic equations, but evilly stole the solution, and that the wronged person has not been accorded the recognition which posterity owes him. Historical evidence shows that such an admonition has become a respectable platitude—an admirable one, perhaps, but nevertheless a platitude. That is to say, careful study of the *Ars Magna* would have shown that Cardan indicated [229] what he took from Niccolò Tartaglia (1505-1557), although not so plainly as one might desire. Yet at no time after 1554, at the latest, should there have been difficulty in establishing the Brescian mathematician as the possessor of the secret of solution of the equations in question. To do so would not have been so difficult as Thorndike's feat,[230] for instance, of identifying Giovanni da Fontana as the true author of the *Liber de Omnibus Rebus Naturalis* once erroneously attributed to one Pompilius Azalus of Piacenza, or Jarcho's brilliant exploit [231] in both identifying and describing the Italian experimental physiologist and surgeon, Giuseppe Zambeccari (1655-1728), even to the extent of locating the church in which he was buried.

It is certainly true, however, that the men who lived at about the time of Cardan, as well as those who came after him for a century or more, either were not impressed with his quarrel with Tartaglia, or were not aware of it. Martin Antoine del Rio (1551-1608) seemed not to have heard that Cardan had appropriated the algebraic secret held by another man; he was deeply agitated by what he probably thought was a much more serious offense: he said [16] Cardan had composed a work, never

printed, in which the mortality of the soul was affirmed.* Cardan, he declared, would show this work only to his friends.

Daniel Georg Morhof (1639-1691) was by no means wholly amicable in his treatment of Cardan in print,[23] but he did not mention the controversy between Cardan and Tartaglia: "HIERONYMUS CARDANUS, Mediolanensis, Portentum ingenii insigne, intuitu mistae cum sapientia. Stultitiae, [*sic*] Novator in multis & Polygraphus, si quis alius. Tot enim libb. scripsit, ut & de *suis libris* ipse librum conscripserit, quo recenset tempora & occasiones librorum, à se scriptorum. Tria statuit Elementa, Aerem, aquam & terram: Ignem sublunarem videt, astra calida magis & minus statuit; quae in libris suis *de subtilitate & varietate* fuse deduxit."

Gabriel Naudé (1600-1653) certainly knew about Tartaglia, but in the generally deprecatory life and judgment of Cardan prefixed to the *Opera Omnia* he did not see fit to censure the Milanese in this particular respect: "quis negabit librum de Proportionibus dignum esse, qui cum pulcherrimis antiquorum inventis conferatur? Quis in Arithmetica non stupet, eum tot difficultates superasse quibus explicandis Villafrancus, Lucas de Burgo, Stifelius, Tartalea, vix ac ne vix quidem pares esse potuissent?" It is of course possible that Naudé could have known of Tartaglia without knowing of the controversy; on the other hand, as is well known, Tartaglia's own version of the affair had been in print since 1554, long before Naudé was born.

Pierre Bayle (1647-1706) sought to avail himself of a large part of what other writers had said about Cardan in his article on Cardan in the *Dictionaire historique et critique*,[24] but he said nothing of the quarrel between Cardan and Tartaglia. David Clement (1701-1760), in his *Bibliothèque curieuse, historique et critique*,[32] mentioned neither the controversy nor the *Ars Magna*.[71] But he was nevertheless well aware of the specific charges of impiety that had been made against Cardan by earlier commentators, even though he may never have heard of the accusations of plagiarism.

James Crossley (1800-1883) likewise did not mention the quarrel; in fact, he appeared to be willing to accord [85] to Cardan something that was not his: "He was a mathematician, and is celebrated as the inventor of one of the most important rules in Algebra, which goes by his name." But Claude-François Michéa (1815-1882), writing only thirty-three

* The writer does not wish to minimize the possibility that as late as the first part of the seventeenth century, impiety might have been considered a much more serious infirmity than plagiarism. Some of the effects of the Counter Reformation were by no means confined to the sixteenth century.

years after the publication of Crossley's paper, referred specifically [9] to the appropriation by Cardan of Tartaglia's solution, and he knew that Cardan had obtained the information by subterfuge. It is significant that of the standard encyclopaedias [94, 109, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241] that have appeared on the continent, not one omitted the story of the relationship between Cardan and Tartaglia. A writer in the most recent Italian encyclopaedia,[241] published in 1943, had this to say of the affair: "Benchè abbia probabilmente usurpato al TARTAGLIA il metodo di risoluzione dell' equazione cubica esposto nella sua opera *Ars magna de rebus algebraicis*, pubblicata nel 1545 e nella quale si trovano anche preziose notizie storiche sullo sviluppo dell'algebra, CARDANO ebbe tuttavia a lasciare profundi segni della sua originalità." Certainly, Tartaglia has not been deprived of credit for his knowledge of the method of solution of cubic equations, in our time or for many years anterior to the present.

The incident in question may be recounted briefly herein, not at all because it needs to be, but merely for the sake of convenience for the reader. Niccolò Tartaglia (1505-1557) of Brescia, who may [119, 242] or may not [243] have been largely self-educated,* at some time prior to 1536 came upon a method for the solution of equations of the third degree. In November of 1536, as Cardan himself related [244] in the early part of *De Libris Propriis*, one Giovanni Colla came to Milan to seen out Cardan. Colla told Cardan that Scipio Ferreo of Bologna had discovered the solution of equations of the third degree, but that Tartaglia and Antonio Maria Fiore, a pupil of Ferreo, also knew the solution.[244] Fiore, it would appear, had unwisely challenged Tartaglia to a mathematical disputation that had been held in Venice in 1535. Fiore had beaten other mathematicians in such contests, but Tartaglia himself was a man of such repute that the tournament had attracted widespread attention. Fiore had been decisively defeated, and it is not surprising that Cardan, at the time deeply concerned with mathematics, should have heard of the Brescian's victory. In 1537, about a year after the visit of Colla to Cardan, Tartaglia published a work on artillery,[119] but it contained no hint as to the equations that had aroused the curiosity of Cardan. Finally, in 1539, Cardan's patience became exhausted. He induced a bookseller to intercede in his

* Papadopoli (reference 243) suggested that Tartaglia did have some more or less formal assistance in gaining an education. But Papadopoli, it should be said, often is rated as being untrustworthy, even by some Italian critics. In this respect, see: Colle, F. M.: *Storia scientifico-letteraria dello studio di Padova . . . pubblicata per la prima volta con alcune annotazioni da Giuseppe Vedova.* Padua, Tipografia Minerva, 1824, vol. 1, p. xi.

behalf with Tartaglia. Tartaglia has given the story in his *Quesiti et Inventioni Diverse*;[245] he disclosed that Cardan, through the bookseller, had asked for the solution to cubic equations, assuring Tartaglia that he would publish the solution if the Brescian wished it to be published, or that he would keep the solution a secret, if that should be Tartaglia's desire. Tartaglia advised Cardan[245] that if he (Tartaglia) wished the solution to be printed, he himself would cause it to be published in a book bearing his own name. Hence, this particular maneuver on the part of Cardan failed.

An exchange of letters followed. At length, Cardan told Tartaglia that he had sent a copy of the Brescian's book on artillery to the Marquis Alfonso d'Avalos (1502-1544), at that time governor of Milan, military commander in the service of the Emperor Charles V (1500-1558), and the possessor, as Tartaglia doubtless knew well, of many cannon. This action on the part of Cardan was clever; a short time later he began to dangle the bait for which he was sure the Brescian was waiting: he asked Tartaglia to come to Milan to meet the marquis. Tartaglia did so in March of 1539, but when he arrived he discovered that the marquis was not in Milan. Tartaglia then revealed the solution of the equations to Cardan. In his book[245] Tartaglia wrote—and this is an important point—that he had withheld the solution only because he had planned to publish it himself. He gave Cardan the solution in the form of a mnemonic doggerel he had composed for himself so that he would be able to remember the solution. Cardan, for his part, was to keep the solution a secret, and he apparently swore to do so. Tartaglia then threatened Cardan with punishment, if he revealed the solution, in the form of revelation of certain unwholesome information about the physician, even if Cardan in publishing the solution should give Tartaglia full credit for the discovery.*

* Dayre in 1927 indicated that he would accept the well-known classification by Wilhelm Ostwald (1853-1932) of scientific men into two main types: the "romantic" type and the "classical" type. Dayre thought Cardan could be classed as the "romantic" type and that Tartaglia would be the "classical" type. Ostwald wrote: "Le romantique a toujours un trop-plein d'idées, de plans, de moyens, et, dans ses écrits, il s'efforce toujours et surtout de se débarrasser de ce trop-plein, pour faire place à d'autres choses qui attendent encore à l'arrière-plan. Mais la déliverance ne peut arriver que si le problème est résolu et la tâche accomplie. La grande vitesse de réaction permet un travail particulièrement rapide; grâce à elle, les moyens imaginables sont déjà étudiés par l'esprit d'une manière, très féconde, de sorte que la réalisation peut se faire sur une base assez large. Ainsi, le romantique peut *expédier* en peu de temps de grandes quantités de travail, qui provoquent l'étonnement du classique réfléchi. . . . Le premier souci du romantique est de déblayer le problème dont il s'occupe pour faire place au suivant; celui du classique

In the ensuing weeks Tartaglia began to regret the disclosure he had made. He commenced to question Cardan about the new book on arithmetic [246] he had heard the Milanese physician had planned to publish. Doubtless he feared that in this book Cardan had revealed the solution the Brescian had guarded so carefully. Tartaglia promptly received a copy of the work. He perceived that his fears were groundless. But he replied to the gift by attacking Cardan for certain errors that appeared in the work, and he later continued the attack with great ferocity, as Cardan observed in the *De Libris Propriis*.[247]

Now, the solution actually was published by Cardan, as is well known, in the *Ars Magna* [71] of 1545. Cardan's version of the celebrated affair is worth repeating. He said [248] that he had been deceived by Luca Pacioli or Luca di Borgo (*c.* 1450-1510?), who had written that there were no other general rules in algebra than the ones he (Pacioli) had made known; hence, Cardan had not attempted to seek further. When he received Tartaglia's secret, therefore, he recognized that what Pacioli had written was not true, and the solution of the Brescian had stimulated him to additional labors on the problem. This work, he said,[248] he had carried out partly by himself and partly with the aid of others such as his one-time *famulus*, Louis Ferrari (1522-1565). He then said that in his book, *Ars Magna*,[71] would be found the names of all the men who had contributed to the broad general problem. In the twenty-eighth chapter [249] of *Ars Magna* Cardan reiterated his indebtedness to Tartaglia:

> Caput xxviii. De capitulo generali cubi et rerum aequalium numero, Magistri Nicolai Tartagliae, Brixiensis—Hoc capitulum habui à prefato viro ante considerationem demonstrationum secundi libri super Euclidem, et aequatio haec cadit in R. cu v binomii ex genere binomii secunda et quinti m. R. cuba universali recisi ejusdem binomii.

There is, of course, no doubt as to the breach of faith on the part of Cardan. It was flagrant, even if allowance is made for the moralities of

est de traiter ce problème de façon si complète, que ni lui, ni aucun de ses contemporains ne puisse en corriger le résultat. . . . Pour emprunter une comparaison au règne animal, nous dirons que le romantique fait de ses produits ce que le coucou fait de ses œufs; il se contente de les mettre au monde et il en abandonne volontiers à d'autres le développement ultérieur. Au contraire, le classique ressemble à l'ourse de la fable, qui lèche patiemment et soigneusement son petit et ne laisse aller, qu'après lui avoir enseigné tout ce qu'elle peut; ainsi se développe un sentiment très marqué de propriété pour sa production." See: Dayre, Jean: Jérôme Cardan (1501-1576). Esquisse Biographique. *Annales de l'Université de Grenoble* [section lettres-droit] 4 (new series): 245-355, 1927. See also: Ostwald, Wilhelm: *Les grands hommes*, translated from the last German edition by Marcel Dufour. Paris, Ernest Flammarion, Publisher, 1912, pp. 273-277.

the sixteenth century in respect to mutual relationships. Italian commentators in general have approached the matter with great caution.* Bortolotti,[250] for instance, in his piece of 1919 on the celebrated algebraists of Italy, mentioned the incident in question, but did not venture a judgment as to the virtues or shortcomings of either man. In his essay of 1926, on the contributions of Tartaglia and Ferrari to the theory of cubic equations, Bortolotti [251] reviewed Cardan's actions in some detail, and suggested that the sins of Cardan had been overemphasized. In his history of mathematics at Bologna, printed in 1928, Bortolotti [252] more boldly observed that there was no indication that Tartaglia had ever intended to publish his solution and thus make it available to all men, and he said, further, that Tartaglia had been unjustly offensive to Cardan. But in his paper of 1935 on the moral and psychic personality of Cardan, Bortolotti [253] complained that the Milanese had been badly treated and much misunderstood, even by contemporary Italian writers:

> Nel caso presente poi avviene che i letterati, i psicologhi, gli storici che studiano il *caso Cardano*, non hanno preparazione matematica idonea ad una esatta valutazione del fatto scientifico; d'altra parte i matematici che vogliono essere informati su la storia della loro disciplina, non hanno tempo da buttare nel latino di *Cardano* e nei Cartelli di Ferrari, e, senza entrare nel merito si affidano a manuali di divulgazione, scritti per lo più senza eccessive preoccupazioni di ordine critica.
>
> Si intende così come anche in libri usciti di recente "*perchè servisscro di guida a maestri ed a discepoli*," la figura del *Cardano* appaia mostruosamente deformata.† In un'opera posteriore,† più vasta e dall'Autore destinata a "*dare all'Italia una completa storia della matematica scritti da penna italiana*," l'errore non è smentito, anzi, con la insistenza in particolari tanto inesatti quanto suggestivi, viene effettivamente rincalzato.

Bortolotti's indignation was not echoed by Vidari, who in 1904 [44] refused to judge the controversy and who in 1930 [109] merely mentioned it without setting forth an opinion concerning it. In the paper of 1904 [44]

* One reason for the reluctance of Italian commentators to censure Cardan's plagiarism from Tartaglia may be that such disapprobation might tend to diminish Cardan's stature in fields of mathematics other than algebra. French critics, for instance, have long contended that the French barrister, François Viète (1540-1603), did much to apply algebra to geometry in such a manner as to lay the foundation for the advent of analytical geometry. Italian historians of mathematics generally have sought to defend the prominence of Cardan in this field. Derogation of Cardan in any branch of mathematics would of course attract suspicion of his achievements in all branches.

† Both the volumes referred to here are by the Italian mathematician, Gino Loria. The first is his *Pagine di storia della sciensa*, published at Turin in 1924. The second is his *Storia delle matematiche*, volume 2, published in 1931. The writer has not seen either of these two works.

Vidari said he would be content to allow more competent critics, such as Cantor,[254] to determine whether Cardan actually was a great mathematician or a plagiarist. Cantor,[254] who carefully examined all Cardan's writings on mathematics, concluded that the Milanese physician was indeed great, and that his eminence could be ascribed to achievements other than the solution of cubic equations. But even Cantor remarked that: [254]

> Cardano hat ein jedenfalls nicht geschmeicheltes Bild seiner selbst der Nachwelt hinterlassen. Ein Widerstreit von Leidenschaften der niedrigsten Art und tiefster Frömmigkeit, von umfassendstem Wissen und blindem Aberglauben steht er vor uns. Seine äusseren Lebensschicksale zeigen uns frühreif durch harte, alle körperlichen und geistigen Kräfte fast in Uebermasse einstrengende Erzichung.

Among the French, Montucla [242] was unfavorably disposed toward Cardan.* Sardou [94] in 1855 spoke of the controversy, but was not moved to condemn Cardan for his part in it. An anonymous writer † in the *Nouvelles annales de mathématiques* [255] in 1856, however, referred to "les traîtreuses révélations de Cardan" in respect to the physician's disclosure of Tartaglia's secret. Tannery,[252] in the *Grande encyclopédie*, conversely, maintained that Cardan had acted in the public interest, and that "il a rendu pleine justice à l'inventeur dont il publiait la découverte sans autorisation." Still another French writer [256] ignored the question entirely in his account of Cardan, but credited the Milanese with an invention which was not his: the Cardan shaft, or universal joint.

Sir Thomas Browne's complaint [257] that Cardan was "a great enquirer of truth, but too greedy a receiver of it" probably had its origin in Cardan's appropriation of the Brescian mathematician's secret. The same consideration may have engendered some of William Gilbert's aspersory remarks about Cardan in *De Magnete*.[227, 228]

Most of the testimony adduced thus far belongs to the older literature

* Hallam, it should be pointed out, wrote that Pietro Cossali had charged that Montucla never had read Cardan's *Ars Magna*. See: Hallam, Henry: *Introduction to the Literature of Europe, in the Fifteenth, Sixteenth, and Seventeenth Centuries*. London, John Murray, 1839, vol. 1, pp. 628-634.

† The paper referred to is not signed or otherwise identified, but is presented as being "D'après Cossali, t. II, p. 96-184," meaning the work, *Storia critica d'algebra*, of the Theatine historian of mathematics, Pietro Cossali (1748-1815), printed in 1797. Unfortunately, the writer has not been able to obtain Cossali's history, and therefore is not prepared to say whether the paper in the *Nouvelles annales de mathématiques* is an independent French production or merely a restatement of the ideas of Cossali. Vidari (reference 44) attributed the paper in the French journal to Professor Terquem, but the paper actually bears no one's name. Professor Terquem was one of the two editors of the *Nouvelles annales de mathématiques*; he may have been the author of this paper, but the writer does not know that he was.

concerning both Cardan and the history of mathematics. In 1944, however, Miller [258] in effect endorsed the protests of Bortolotti [258] by writing:

> Both the solution of the general quadratic equation and the solution of the general cubic equation are dependent on the theory of complex numbers and there is no evidence that Tartaglia was familiar with this theory. Hence he could not have solved the general cubic equation in the modern sense of the term. It is also true that H. Cardan could not have solved this equation even if he made slight formal use of complex numbers in his "Ars Magna." The history of the development of the number concept furnishes the key to many other inaccurate assertions in the history of mathematics. It also simplifies this history by uniting many related advances. In particular, the reputation of H. Cardan has greatly improved as a result of recent studies.

As to the credit which might go to Cardan as the man who, through the medium of his book, made Tartaglia's secret widely available to the men of his time, that is a question to which a satisfactory answer cannot be given. In contemplating this problem, the investigator must decide whether he will accept or reject Tartaglia's belated complaint that he had planned to publish the solution himself, and thus bequeath it to all men. Again, there is the judgment of Montucla,[242] who was not a champion of Cardan:

> Cardan est encore le premier qui ait aperçu la multiplicité des valeurs de l'inconnue dans les équations, et leur distinction en positives et négatives. Cette découverte qui, avec un autre de Viète, est le fondement de toutes celles d'Harriot et de Descartes sur l'analyse des équations, cette découverte, dis-je, est clairement contenue dans son *Ars Magna*.

To conclude this short account of the quarrel of Cardan with Tartaglia, reproduction of Cardan's own appraisal [244] of his achievements in mathematics might prove of interest:

> Si nos gloriaremur artem [algebra] hanc à nobis inventam, tametsi de ea Nichomachus, Ptolemaeus, Paciolus, Boëthius, multa scripserint, fortasse non mentiremur. Nam neque centesimen partem eorum, quae à nobis inventa sunt, tanti viri attigore. Sed de hoc ut de aliis iudicium successoribus nostris relinquimus. Nos tamen ob id, perfectum id opus appellavimus, quòd humanum sensum fermè excedit.

It would have pleased him, we can be sure, if he could have known that in the last decade of the nineteenth century, the mathematicians of Europe were still competing, as Gegenbauer [259] has shown, in problems associated with "la cas irréductible de la formule de Cardan."

Thorndike [260] in 1905 wrote that Cardan was "one of the most prominent men of his time in mathematics and medicine—indeed the discoverer

of new processes in the former science . . ." Thirty-six years later Thorndike [64] wrote that Cardan "had gone into the theory and practice of medicine, but into neither surgery, anatomy, nor botany." The latter statement seems only partly adequate. It is true in respect to surgery, not true in respect to botany, is at least debatable in respect to anatomy,* and is too abrupt a dismissal of Cardan in respect to medicine.

For the results of research by several investigators in recent years have shown that the place of Cardan in medicine actually is very high. Castiglioni [261] said that Cardan was a pioneer in the field of psychiatry, and that he did important work in pathologic anatomy and teratology. The Singers [262] likewise gave to Cardan an impressive place in medicine: ". . . although he did little directly to develop the theory of infection, [he] yet made suggestions that in the hands of others became exceedingly fertile." Cardan was, in the opinion of the Singers,[262] associated with the belief that the seeds of disease actually are living—and if this opinion is accepted, then Cardan's place in the history of the theory of infection is formidable indeed.

In other aspects of medicine Cardan's eminence is readily demonstrable. For years it had been the practice to credit Jerome Fracastor (1478-1553) of Verona with being the first to describe typhus fever. But Major [58] in 1932 asserted that "Typhus fever was apparently first described by Jerome Cardan, although the credit is usually assigned to Fracastor." Cardan's account is found in the thirty-sixth chapter [118] of his first printed book, *De Malo Recentiorum Medicorum Medendi Usu Libellus.* It undoubtedly antedated the work of Fracastor on the same subject, although Fracastor's clinical description of the disease has been called [58] unquestionably superior to that of Cardan. In Cardan's work even the title of the chapter is satiric—"Quod pulicarē morbū, morbillū credūt," [118] for it will be recalled that this book was written to humble the enemies of the Milanese. Yet the chapter itself reflects acuity of judgment, quick perception, and sagacity. Cardan complains that multitudes of patients have perished because physicians have persisted in believing that *morbus pulicaris* is measles and have thus treated the disease as they would treat measles. He describes the gross aspects of the lesions, distinguishing them from those of measles; points out that measles usually attacks a person

*For instance, pages 129 through 167 of volume 10 of Cardan's *Opera Omnia* are devoted to an exposition of the anatomy of Mondino de' Luzzi (1270?-1326). The formal title of Cardan's piece is: "Anathomiae Mundini cum expositione Hieronymi Cardani." Nevertheless, the writer would not contend that this exposition by Cardan represents a contribution to anatomy in the sense entertained by Professor Thorndike.

but once, whereas *morbus pulicaris* can afflict the same person several times; he reminds the reader that *morbus pulicaris* is no respecter of age, whereas measles is associated with the young. Finally, by means of an excluding phrase—when he says that measles never is associated with the bubonic plague—as well as by his use of the term *morbus pulicaris* itself, Cardan came closer than he realized to showing that he knew the carrier of typhus fever, even if he did not know the causative agent.

De Gerando [263] more than a century ago paid tribute to Cardan as an originator of a method for the instruction of the deaf: " S'il fallait reconnaître l'origine de l'art dans l'exposition faite, pour la première fois, du principe théorique sur lequel repose l'art d'élever les sourds-muets, l'honneur de cette découverte appartiendrait à un philosophe italien, à Jérôme Cardan, et Pavie eût été le berceau de l'art." The method is found in the eighth chapter [264] of Cardan's *Paralipomenon*. The chapter is called simply " De surdo & muto literas edocto." The technic is in fact as simple as the title of the chapter would suggest. Cardan argues that objects and ideas can be communicated to deaf mutes by the visual pathway; writing is associated with speech, and speech with thought, but visual perception can help the deaf mute to connect written characters and ideas without the necessity for sound. The method seems elementary enough in our time, but so, also, do the prototypes of most of our modern technics or procedures.

Cardan's skill as an internist must be accepted largely on the basis of his own testimony, but Cunha [63] especially praised the Milanese physician's treatment of Archbishop Hamilton's * asthma in 1552, and Dana [12] concurred, remarking: " Personal hygiene, diet, exercise, cold baths, rest, sleep—what more could Sir James Mackenzie of London and St. Andrews have done for an Archbishop today? " Cunha,[63] moreover, thought Cardan, in his statement that erysipelas and pains in the joints had afflicted him after a particularly virulent infection of one of his teeth, foreshadowed the theory of focal infection.

* Isaac de Larrey (1638-1719) wrote: " Cet Archevêque languissoit d'une hydropsie, que les Médecins jugeoient incurable: mais il en fut gueri par Cardan, qui passa en suite en Angleterre. Ce fut dans ce tems-là qu'il vit Edouard, & qu'il eut avec lui cet entretien touchant les cometes, dont j'ai parlé ailleurs. Ce fut aussi à cette occasion qu'il fit de ce jeune Roi le merveilleux portrait que j'ai raporté au même lieu. S'il en faut croire ce que l'Histoire nous dit de ce fameux Astrologue, il donna une terrible preuve de sa science à l'Archevêque qu'il avoit gueri, lors que prenant congé de lui, il lui tint de ce discours: *Qu'il avoit bien pu le guerir de sa maladie; mais qu'il n'étoit pas en son pouvoir de changer sa destinée, ni d'empêcher qu'il ne fût pendu.* Sa prediction fut verifiée par l'évenement, & dix-huit ans après ce Prelat fut condamné par les Commissaires que lui donna la Reine Marie, Regente d'Ecosse, a etre pendu: ce qui fut executé." See reference 329.

Some of Cardan's contributions to medicine and the allied sciences were especially ingenious. He tried to analyze the effects which mirrors and prisms exert on light;[102] he thought he could recognize principles of magnetic and electric attraction between lovers;[103] he worked on the subject of what may have been carbonic acid gas;[103] he discussed warmth * and the influence of color on the absorption of calorific rays, and concluded that the perpendicular rays are the most active.[103] One of his

* Other of Cardan's speculations concerning heat, cold and climate were recounted before members of the Academy of Padua in 1786 by Giuseppe Toaldo: "Questo grand'uomo [Hippocrates] dunque nel suo Trattato *de aere, aquis & locis* (Lib. II. tex. 10.) parlando della salubrità de'luoghi, *le Città rivolte verso del Sol Levante*, dice, *devono esser più salubri di quelle che riguardano Tramontana, e molto più di quelle, che ricevono i venti caldi; se anche non vi fosse che la distanza d'uno stadio*: e ne adduce quella vera ragione, confermata colle nostre osservazioni, che il Levante gode d'una certa temperie di caldo e di asciutto. Cardano, commentando questo testo, acutamente distingue due specie di calore: 'Una, dice, dipende dai raggi diretti del Sole; e questo è un calor moderato, puro, sano, che regna nelle prime ore della mattina: l'altra che proviene dai raggi riflessi della Terra, dai vapori, e dalle esalazioni; e questo è un calore torbido, impuro, morboso, proprio della sera, e della Plaga di Ponente, in parte anche di quella di Mezzodì. La Tramontana per opposto è priva di caldo; perciò l'aria non vi è purgata: la stessa indole partecipano i rispettivi venti.'

"XXXIV. Si può dire che Cardano, il quale fu veramente un ingegno prodigioso, travedesse un'opinione, la quale a'giorni nostri ha preso gran voga, e viene sostenuta con sode ragioni dai più gravi Fisici. Questa è, che il lume del Sole non è gia caldo da per se stesso; ma che non fa altro se non che eccitare colla percossa de'suoi raggi, sviluppare, e porre in azione quel fluido elastico, che si chiama fuoco imprigionato nei corpi terreni, e che si spiega nei vapori, nelle esalazioni, e nelle altre emanazioni in questo atto prodotte. Veggasi tra gli altri il Sig. De Luc nelle *Lettere Fisiche e Morali* (Lett. 142, e seguenti). Non badando dunque alla distinzione dei raggi diretti e riflessi fatta da Cardano, è però da tenere per indubitabile ciò che soggiunge, che il calor dell'Atmosfera dipende dal fuoco sviluppato in essa colle esalazioni terrene, e che da queste elevate e raccolte in maggior copia dipende il gran caldo tanto della State, che delle ore pomeridiane, al quale vanno soggetti i corpi, e luoghi esposti a Ponente: quando nelle ore ed esposizioni Orientali per la minor copia de'vapori regna una dolce temperie, ed una specie di salutare serenità: principio che servirà all'oggetto della vegetazione, e che ora decide per quello delle abitazioni.

"XXXV. Quindi coll'esposto principio Cardano soggiunge: 'In ogni provincia vi sono Città disposte altre meglio, altre peggio; parimenti castelli e borghi: e nella stessa Città (non che in distanza d'uno stadio) una contrada si trova più vantaggiosamente situata, che un'altra; e nella stessa casa una stanza più che l'altra (s'intende sempre supposte pari le altre circostanze).' Porge il Cardano una specie di rimedio per chi fosse svantaggiosamente alloggiato. 'Chi non abita in Camera, in cui entri il Sole Levante, essendo per altro il luogo Orientale, apra almeno le finestre dal levar del Sole fino all'ora di terza, specialmente se spiri il vivifico vento Orientale; perchè il Ponente è vapido e floscio, e il Tramontano non è buono che nelle ore pomeridiane di State.'" See: Toaldo, Giuseppe: Delle qualità fisiche delle plaghe. *Saggi scientifici e letterarj dell'-Accademia di Padova* 2: 121-145, 1789.

treatises was included in a book [265] on the treatment of syphilis published as late as 1728.*

Not all Italian commentators have given Cardan unqualified praise. Puccinotti,[266] obviously disturbed by what he thought was Cardan's perfervid devotion to Peripatetic and Arabist tenets in medicine, dismissed him in less than half a page, concluding satirically: "Tale infine fu la sua modestia, che egli si spaccia per il settimo gran medico dopo la creazione, perchè ogni mill'anni ne nasceva uno." Another Italian critic [93] wrote that Cardan was not able to make contributions to anatomy because he had "il terrore per la morte e l'orrore per i cadaveri . . ."; and maintained that Cardan's own contemporaries, such as Andreas Vesalius (1514-1564), Costanzo Varolio (1542-1575), Giovanni Filippo Ingrassia (1510-1580), Jerome Fracastor (1478-1553), Gabriel Fallopio (1523-1562) and Andrea Cesalpino (1519?-1603), all surpassed him because he lacked foundation in the elements of medicine. Exactly the opposite view was expressed by still another Italian authority,[61, 261] and Capparoni [54] was intense in his admiration of Cardan, saying that the Milanese evolved a precursor of the theory of cerebral localization, that he demonstrated that catarrhal secretions could form in the nasal, oral and laryngeal cavities instead of primarily in the head, as Hippocrates and Galen believed, that he indicated the possibility of transfusion of blood, did early work which suggested the development of the hygrometer, and noted the effects of dryness or humidity of the atmosphere on the contraction or relaxation of the bowel.

German commentators have been inclined, generally, to stress the value of Cardan's contributions to medicine. Rixner and Siber [267] in 1820 said that:

> In der Medicin endlich erklärte er zuerst die wahre Bedeutung der kritischen Tage, und die Theorie des pestartigen Fiebers; lehrte die Cur des Podagra, und zeigte, wie die Heilung einer besondern Krankheit zur Erkenntniss und Hebung des allgemeinen Krankheitsstoffes in einem Körper dienen möge; gab eine reiche Geschichte des Urines, und erklärte die schwersten Bücher des Hippokrates.

Pagel,[268] for instance, thought it might be said that Cardan had anticipated some of the work of Caesare Lombroso (1836-1909): †

* But Cardan's fame was not always thus happily preserved. One of his pieces on gout was reprinted in 1644 in a little book of ridiculous or silly writings by various men. See: Hieronymi Cardani Mediolanensis, Civisque Bononiensis Medici Podagrae Encomium. In: *Dissertatjonum Ludicrarum, et Amoenitatum, Scriptores varij. Editio nova et Aucta.* Leiden, Francis Heger, 1644, pp. 43-66.

† Curiously, Lombroso himself seems to have entertained this view, according to Bellini. See reference 37.

Vielleicht kann man die Cardanische *Metoposcopia* als Vorläuferin Lombroscher Theorien ausprechen, wie das 1896 G. Antonini für eine 1615 in Strassburg erschienene Schrift eines sonst ganz obskuren Autors Samuel Fuchsius (*Metoposcopia et ophthalmoscopia*) versucht hat.

Kümmel [47] objected to Cardan's use of numbers in the diagnosis and treatment of disease; but Libri [108] credited Cardan with inquiring into the question of whether the effects produced by a medicament are in arithmetic or geometric proportion to the size of the dose administered—perhaps a suggestion of the homeopathic doctrine. This suggestion is strengthened by Cumston's assertion [269] that Cardan, with Philippus Aureolus Theophrastus Bombastus Paracelsus von Hohenheim (1493-1541), "violently attacked the Galenic dogma of *contraria contrariis curantur*." What the two men substituted for it was the doctrine of similars, it is said.[269]

Similarly, Sudhoff [270] said that astrology was not so prominent in the medical theories of Cardan as might be expected, but he did say that astrologic computations figured in some lesser works by the Milanese:

> Dass auch das ungeregelte Genie Girolamo (1501 bis 1576) sich neben Medicin und tausend andern Dingen mit der Astrologie und dem Nativitätstellen befasste, ist bekannt. Hat er doch selbst das "Quadripartitum" des Ptolemaios commentirt (Basel 1554, Fol.°). Dennoch spielt diese Afterwissenschaft in seinen medicinischen Schriften keine grosse Rolle. Er verwirft zwar beispielsweise die Berücksichtigung der Planetenaspekten bei Verabreichung der Arzneien keineswegs ("De malo recentiorum medicorum medendi usu," Venetiis 1545, 8° [77 num. Bll.] Bl. 18b), verspottet aber den künstlichen Aufbau der kritischen Tage bei Galenos mit Rücksicht auf den Mondlauf und behauptet, Galenos müsse von Mathematik sehr wenig verstanden haben, wie sehr er sich auch dessen rühme; der 20. Tag als kritischer lasse sich niemals aus dem Mondlauf erklären, wohl aber aus dem Einfluss der Sonne, der mächtiger sei als der des Mondes ("Contradicentium medicorum liber," Venetiis 1545, 8° [188 num. Bll.], Bl. 55b ff.). In seinen Commentaren zu den "Epidemien" und den "Aphorismen" des Hippokrates sucht er die Krisen aus der Bedeutung der Siebenzahl allein herzuleiten.

Sprengel,[271] in particular, was generous in his evaluation of Cardan's work in medicine. He called him a forerunner of Conrad Victor Schneider (1610-1680), for whom the schneiderian membrane which lines the nasal fossa is named, because Cardan "behauptet ausserdem, dass der Abfluss des Schleims aus der Nase und dem Munde nicht immer unmittelbar aus dem Kopfe herrühre, sondern dass sehr oft auch diese Feuchtigkeiten in den Absonderungs-Werkzeugen des Schlundes und der Nase selbst erzeugt werden"—essentially the same observation that Capparoni [54] made in 1926. Sprengel [271] said that Cardan apparently recognized the significance

of the occurrence of epilepsy in melancholia; that among a dozen physicians called in to attend a countess, Cardan was the only one shrewd enough to determine that what seemed to be pregnancy actually was not; that Cardan was able to detect and define opisthotonos; that he successfully treated certain maladies * by inunction with oil of camomile; that he treated pulmonary tuberculosis with happy results; and that in the latter disease he employed *Iris florentina, confectio rosae,* and syrup of *Adiantum capillus-veneris.* Cardan is credited [271] with ridiculing the ancient belief that a person who has a febrile disease should not be given wine; and with warning against the use of unrestricted bloodletting in the presence of apoplexy. Cardan has been called [64, 68] one of the first to advocate the transfusion of blood to criminals: he thought the evil tendencies of such persons could be ameliorated or eradicated by withdrawal of part of their blood and by infusion of blood from men of good heart.

It seems plain enough that Cardan did not concern himself much with anatomy: " Es ist nur zu bedauern, dass Cardanus, nach seinem eigenen Bekenntniss,† sich so wenig mit der Anatomie beschäftigt hat, obgleich er sie an andern Orten ** wieder sehr empfiehlt." [271] Had Cardan made any great contribution to this basic science, it seems likely that Martinotti [272] would have recorded it in his long treatise on the historical development of the teaching of anatomy at the University of Bologna, which he did not. Cardan himself remarked [273] only that many considerations frightened him away from anatomy. The reactions of two of Cardan's modern translators to this cryptic remark are interesting. One,[93] as has been shown, concluded that it signified Cardan's fear of death and his horror of cadavers; the other [274] thought it arose from the fact that " The prejudices of the age against the newer methods of anatomy were violent . . ." But Cardan must have had a good practical knowledge of anatomy, as well as physiology, because he said [275] he had brought about the re-introduction of a better and shorter operation for hernia.

Thorndike's statement [64] that Cardan had not concerned himself with botany is open to cavil. For one thing, the eighth book [276] of *De Subtilitate,* called " De Plantis," is devoted to various plants; Cardan mentions such places as India, Macedonia, Ethiopia, Arabia, Spain, England, and, more significantly, uses such phrases as " in provincia Peru occidentalis

* Probably simple myalgias.

† In the thirty-ninth chapter of the *De Vita Propria Liber.* See reference 273.

** In the eighty-ninth chapter of *De Methodo Medendi.* See reference 68.

Indiae" and "in Hispaniola insula occidentalis Indiae," * showing that he was even aware of plants of the New World. The latter two phrases impart added interest to Cardan's opening statement in the forty-first chapter [277] of *De Vita Propria Liber*:

Inter naturalia ostenta, primum illud quod & rarissimum est, natum me esse hoc seculo, in quo totus orbis innotuit, cum antiquis paulo plus Triente cognitum fuisset: Hinc lustramus Americam (nunc partem propriam appello) Brasiliam, maximam incognitae antea portionem, terram ignitam, Patagones, Peru, Charcas, Parana, Acutia, Caribanam, Picoram, Hispaniam novam, & ea magis meridiem versus Floridam, Corterealem, Estotitilant, Marata.

But there are other evidences of Cardan's keen interest in plants. It is well known that he wrote on China root, or *Smilax china*,[75, 265] and that, in his chapter [116] on his own successes in practice, he mentioned the various drugs and medicaments he had employed. Cardan has intimated [212] that he did not know his contemporary, the herbalist Antonio Musa Brasavola (1500-1555) of Ferrara, whose *Examen Omnium Simplicium Medicamentorum Quorum in Officinis Usus Est* [278] was published at Rome † in 1536, the year in which Cardan's first book [66] was printed at Venice. But Cardan's friendship with Francesco Bonafede, lecturer in materia medica at the University of Padua, is well known, although he said [99] he never had studied under Bonafede. A short passage from the close of the forty-fourth chapter [275] of *De Vita Propria Liber*, which provides something of Cardan's own estimate of himself as a physician, also shows that he prided himself on having written about the use of *Equisetum arvense* for dropsy:

Interpretatio etiam à me librorum difficiliorum scripta est Hippocratis,** praecipuè legitimorum, sed nondum perfecta est qua die haec scribimus, scilicet xvi. Calendas Decembris M. D. LXXV. Praeterea materiam de morbo Gallico ampliter, & experimenta ad morbos difficillimos comitialem, insaniam, caecitatem, in paucis, ut de seta equina ad hydropem; alias ad scirrhos, urigines meiendi, morbos articulares plurima, & ad lapidem renum, colicam, haemorrhoidas, & alia ad v. millia. Absolu-

* In the seventh book of *De Subtilitate*, called "De Lapidibus," Cardan speaks of stones from Cuba.

† Curiously, Brasavola's printer, Antonio Blado, was the same man who printed Cardan's *In Librum Hippocratis De Alimento: Commentaria* in 1574 (reference 73). Blado was apostolic printer to Pope Paul III (1468-1549) in Rome. The modern type face, *Blado*, is named for him; he is justly renowned for the great beauty of his types. See: Brown, H. R. F.: *The Venetian Printing Press. An Historical Study Based upon Documents for the Most Part Hitherto Unpublished.* New York, G. P. Putnam's Sons; London, John C. Nimmo, 1891, p. 100.

** See reference 73.

torum autem problematum seu que sitorum ad xl. millia, minutiorum cc. millia relinquam, unde lumen illud patriae nostrae [Andrea Alciato *], appellabat *virum inventionum.*

Scarcely any critic of Cardan has neglected to point out his intolerance of ancient authority,† or, for that matter, any authority other than his own. Libri,[103] not particularly inclined to champion Cardan, nevertheless said that the Milanese ". . . osa seul secouer entièrement le joug, et déclara la guerre à toute l'antiquité. Telesius et Patrizj n'avaient fait qu'attaquer Aristote, sous la bannière de Parmenide et de Platon: Cardan méconnut toute autorité, et ne voulut que sa propre intelligence pour guide." Bury [279] referred to Cardan specifically as an opponent of Aristotle; Capparoni [54] wrote that Cardan ". . . attacca alcuni principi di Galeno da lui riconosciuti errati e lo incolpa di non aver compreso in alcuni casi la vera arte di osservare . . ."

Whewell,[280] almost a century ago, recognized that Cardan stood in no awe of the ancients; he linked Cardan with Jerome Fracastor (1478-1553), Alessandro Benedetti (1460-1525) and Galileo Galilei (1564-1642) as one who helped overthrow Aristotle long before René Descartes (1596-1650), who has been accorded that particular distinction, was born:

> If we had to write the history of philosophy, we should prove by a multitude of facts that it was the Italians who overthrew the ancient idol of philosophers. Men go on incessantly repeating that the struggle was begun by Descartes, and they proclaim him the legislator of modern philosophers. But when we examine the philosophical writings of Fracastoro, of Benedetti, of Cardan, and above all, those of Galileo; when we see on all sides energetic protests raised against the peripatetic doctrines; we ask, what there remained for the inventor of vortices to do, in overturning the natural philosophy of Aristotle?

Similar views were expressed by Tiraboschi,[91] De Gerando [268] and Gumpert.[63] De Gerando,[268] in particular, thought Cardan "mérita de prendre rang parmi les modernes réformateurs de la philosophie." This is interesting, in view of Rádl's belief [281] that in the philosophy of Cardan,

* This praise for Alciato, who apparently exerted a profound influence upon the mind of Cardan, occurs also in the forty-eighth chapter of *De Vita Propria Liber.* See reference 65.

† Cassirer, remarking, "Nur allmählich und schrittweise hat sich innerhalb der italienischen Naturphilosophie die Auffassung des Raumes aus der Aristotelischen Tradition gelöst," singled out Cardan as the one who initiated the movement in this particular field. Cassirer based his treatment of Cardan on the first book of Cardan's *De Subtilitate* (reference 297). See: Cassirer, Ernst: *Das Erkenntnisproblem in der Philosophie und Wissenschaft der Neueren Zeit.* Berlin, Bruno Cassirer, 1922, vol. 1, pp. 257-258.

among others, he could detect the elements of a mechanistic philosophy of life:

Auch die neuplatonischen Wortführer der Renaissance, Cusanus, Telesius, Paracelsus, Cardanus, Giordano Bruno, Leonardo waren noch vitalistisch gestimmt, obwohl man aus den Hypothesen einiger derselben bereits Anklänge an eine mechanische Weltanschauung heraushören kann.

Fischer [282] frankly included Cardan as a precursor of Bernardino Telesio (1509-1588) in the development of modern naturalism. Another German critic [283] did the same: "Die Weltseele, der durch das Universum verbreitete beseelte Äther oder der beseelte Wärmestoff war der Mittelpunkt der Spekulation der Renaissance in Cardano und Telesio." * This critic went further, saying [283] that Cardan, in his detailed, dispassionate analysis of his own faults, obsessions and vengefulness,† displayed the same sort of approach which Baruch Spinoza (1632-1677) later used in his writings on the passions.**

* Rixner and Siber wrote: "In der Naturlehre strich er das Feuer aus der Zahl der Elemente aus; lehrte, dass nur 2 Qualitaten in der Natur, und dass die himmlische Wärme das Princip aller Erzeugungen sey; dass Alles, was ist, Seele und Leben habe; dass aber der menschlichen Seele eine wahre und eigentliche, nicht aber bloss schattenartige Unsterblichkeit zukomme; dass eine Natur, wie Aristoteles sie annimmt, weder ist, noch jemals war, und dass die wahre Naturbetrachtung zu Kunstwerken in der Wirklichkeit fuhren musse." See reference *267*.

† In the *De Vita Propria Liber, passim.*

** But Jöel, after remarking that "die Geschichte der Philosophie kennt kaum heissere Naturen als jene Laurentius Valla und Petrus Ramus, jene Agrippa und Paracelsus, Bruno, Vanini und Cardanus," continued: "Der ganze Antiaristotelismus der Renaissancephilosophie ist Überwindung der Formen durch das Erlebnis. Es ist die Beziehung auf das eigene Lebensgefühl, die damals ein Reformationszeitalter auch für die Erkenntnis heraufführte. Hegel spricht von dem Originalitätsdrang des hier typischen Cardanus: 'Sein positives Verdienst besteht mehr in der Erregung, die er mitteilte, aus sich selbst zu schöpfen.' Deutlicher bezeichnet es Goethe: 'Cardanus betrachtet die Wissenschaften überall in Verbindung mit sich selbst seiner Persönlichkeit, seinem Lebensgange, und so spricht aus seinen Werken eine Natürlichkeit und Lebendigkeit, die uns anzieht, anregt, erfrischt und in Tätigkeit setzt. Es ist nicht der Doktor im langen Kleide, der uns vom Katheder herab belehrt, es ist der Mensch, der umherwandelt, aufmerkt, erstaunt, von Schmerz und Freude ergriffen wird und uns davon eine leidenschaftliche Mitteilung aufdringt. Nennt man ihm vorzüglich unter den Erneuerern der Wissenschaften, so hat ihm dieser sein angedeuteter Charakter so sehr als seine Bemühungen zu dieser Ehrenstelle verholfen.' Dieser Charakter ist eben seine heiss lebendige, starke Gefühlsnatur, die wieder das Staunen hat, mit dem ja die Philosophie beginnen soll, und 'von Schmerz und Freude' und anderen leidenschaftlichen Regungen 'ergriffen wird,' ja ergriffen sein will. Er schnitt und brannte sich, gleich den Flagellanten, Derwischen und Fakiren, er biss sich in Arm und Lippen, nur um zu fühlen, er ging bald ganz langsam, bald rasend schnell, bald in Seide, bald in Lumpen, bald als Spanier, bald als Türke. Man sieht wieder: gerade das lebendigste Ichgefühl drängt zu den wechselnden Gestalten, es

There is ample evidence that Cardan possessed something of the "geologic view" concerning the nature and development of the earth. More than a century ago, Lyell [284] pointed out that "The title of a work of Cardano's, published in 1552, 'De Subtilitate' (corresponding to what would now be called Transcendental Philosophy), would lead us to expect, in the chapter on minerals,* many far-fetched theories characteristic of that age; but, when treating of petrified shells, he decided that they clearly indicated the former sojourn of the sea upon the mountains."

Cardan certainly was not alone in advancing this observation. Bernard Palissy (1510-1590), Andrea Cesalpino (1519-1603), Conrad Gesner (1515-1565) and, later, Niels Stensen (1638-1686), all left evidence behind them [285] that they realized that land and water were subject to certain changes, which is to say, that the presence of fossil marine animals at heights far above sea level could be explained in no other way than that geologic strata were subject to alterations in elevation, so that what is now lofty terrain might once have been covered by water. This conception is expressed in the second book [285] of *De Subtilitate*, called "De Elementis & eorum motibus & actionibus." Duhem [286] has objected to the originality of Cardan's writing on this subject, saying that the Milanese took his ideas from Leonardo da Vinci (1452-1519), and that Palissy merely took his own ideas, in turn, from the work of Cardan. Rádl [287] in 1913 and Usher [288] in 1929 supported the view of Duhem, but seem not to have ventured further than the studies of that author for evidence. But Duhem was disputed in 1934 by Cass: [289] ". . . Duhem failed to prove that Cardan borrowed from Leonardo. It would seem that he [Duhem] was led to make these unfounded criticisms of Cardan because he did not possess sufficient knowledge of the De Subtilitate."

There is good evidence, likewise, that Cardan had at least an elementary understanding of one of the leading tenets of such shapers of the theory of the evolutionary process as Jean-Baptiste de Monet de Lamarck (1744-1829), Charles Darwin (1809-1882) and Herbert Spencer (1820-1903), when he observed in the eleventh book [290] of *De Subtilitate*, "De Hominis necessitate & forma," that nature often creates new species which subsequently disappear if they are not able to maintain themselves. But the

will erleben, und es kann sich nur in anderen erleben." See: Jöel, Karl: *Der Ursprung der Naturphilosophie aus dem Geiste der Mystik*. Jena, Eugen Diederichs, 1926, ed. 2, pp. 20-21.

* The "chapter" actually is the second book of *De Subtilitate*, called "De Elementis & eorum motibus & actionibus." See reference 285.

observation is too fragmentary to permit the ranking of Cardan as an important figure in the development of the theory itself.

It is curious that the name of Cardan is attached, as in the case of cubic equations, to a device which he actually did not invent, and which he did not claim to have invented.* [291] This is the so-called Cardan shaft, as it is identified in most standard dictionaries. The description is found in the seventeenth book [292] of *De Subtilitate*; it refers only to a chair made for a monarch, and so constructed that regardless of the incline of the terrain, the occupant of the chair could sit in comfort, without the least jolting or swaying from the horizontal plane. The principle also had been applied, before the time of Cardan, to the suspension of certain oil lamps.[292] The scheme originally was a method of suspension only. It is perfectly familiar to anyone who has ever examined a marine compass, the face of which, no matter how the ship pitches or rolls, is always maintained in the horizontal plane by four-point suspension in two concentric rings. The introduction of rotary force into this type of suspension, to produce the modern universal joint which is employed in automobiles, was illustrated by Dr. Mór Hoor [294] in 1893.† Berthelot [295] in the same year suggested that Cardan had found a description of the suspension in the ". . . procédés secrets de la magie, auxquels il n'était pas étranger . . ." or more specifically, in the *Mappae Clavicula*, a sixty-four page vellum manuscript supposed to date from the twelfth century (which was

*Cardan is also the recipient of another, and dubious, honor. About ninety years ago an unidentified writer in *Blackwood's Edinburgh Magazine* wrote: "The eccentric and learned physician and mathematician, Jerome Cardan, was the first modern writer who paid serious and scientific attention to the mechanism of marionettes." The unidentified commentator said Cardan had seen two Sicilians operating puppets; Cardan was supposed to have described the scene in *De Rerum Varietate* in this wise: "There was no sort of dance that these figures were not able to imitate, making the most surprising gestures with feet and legs, arms and head, the whole with such variety of attitude, that I cannot, I confess, understand the nature of the ingenious mechanism, for there were not several strings, sometimes slack and sometimes tight, but only one to each figure, and that was always at full stretch. I have seen many other figures set in motion by several strings, alternately tight and slack, which is nothing marvellous. I must further say that it was a truly agreeable spectacle to behold how the steps and gestures kept time with the music." See: The Puppets of All Nations. *Blackwood's Edinburgh Magazine* 75: 392-413 (April) 1854.

†An early form of the Cardan shaft was illustrated also by Feldhaus in his well-known dictionary of technical devices and procedures. Feldhaus correctly introduced the entry "Ringgelenk" with this phrase: "Ringgelenk, meist ohne jeden Grund als Cardangelenk bezeichnet." See: Feldhaus, F. M.: *Die Technik der Vorzeit der geschichtlichen Zeit und der Naturvölker: Ein Handbuch für Archäologen und Historiker, Museen und Sammler, Kunsthändler und Antiquare*. Leipzig and Berlin, Wilhelm Engelmann, 1914, columns 870 and 871.

printed about a century ago in London).[294] Gerland,[295] detailing some of the inventions of Leonardo da Vinci, remarked: "Auch die nach Cardanus genannte Aufhängung eines Körpers, der sich um drei zueinander senkrechten Achsen drehen können soll, bildet er [Leonardo] ab." But Gerland also thought that Leonardo, like Cardan, must have seen the method in the *Mappae Clavicula*.

The well-known Augsburg water machine, as Wolf[296] pointed out, is known to us today chiefly because Cardan described it and included an illustration of it * in the first book[297] of *De Subtilitate*, called "De Principiis, materia, forma, vacuo, corporum repugnantia, motu Naturali, & Loco." Cardan, in introducing the subject, wrote: "Est & alius machinae modus (ut intelligo) Augustae, qui tamen sub hoc genere comprehenditur."[297] Cass,[298] in her commentary to this book, seemed surprised that Cardan should have spoken of Augsburg without identifying the city further: "The only Augusta (among names of cities so-called) which a Milanese would ordinarily mention without qualification as familiar to his readers is Augusta Taurinorum (Turin)." This is an all-too-familiar misapprehension of the nature of the man, for Cardan, who could write on the plants of the New World,[276] who was keenly aware of the climate of Denmark and the temperament of the Danes,[117] who could set out on a long journey to Scotland[127] at a time when such an undertaking was both hazardous and excessively tedious, and who himself had visited such German cities as Cologne, Coblenz, Kleve, Andernach, Mainz, Worms and Spires,[127] surely was not a man whose familiarity with cities was limited to those of his own land, or who would assume his readers were exclusively Italian.

It has seemed to the writer that among the most irrational objections to Cardan are those based on his devotion to astrology. Such objections probably arise from the inevitably fatal procedure of viewing a sixteenth-century man in terms of twentieth-century sophistication, a perilous luxury which only the most ingenuous commentator would permit himself. Yet Cardan's astrology has influenced the attitude of men for centuries toward almost every aspect of the Milanese physician's career, from medicine to religion, and from speculations about his sanity to inquiries as to his

* Pfister, in his chapter on Gaul under the Merovingian Franks, said that Fortunatus described a castle built by the bishop of Trèves on a hill overlooking the Moselle River: ". . . a mechanical contrivance raised water from the river to turn a mill." If the account by Fortunatus is valid, this machine, whatever its nature, would antedate the Augsburg water machine by almost a thousand years. See: Pfister, Christian: Gaul under the Merovingian Franks. Institutions. In: *The Cambridge Medieval History*. New York, the Macmillan Co., 1936, vol. 2, pp. 132-158.

credulity. Bloch,[299] for instance, included Cardan as one of those who believed in the miraculous powers of the king's touch, and Lawrence,[48] doubtless swayed by what he thought was Cardan's implicit faith in astrology and the occult, made the grievous error of calling him a quack. In the fourth chapter of his doctoral dissertation of 1900, Durey [300] adduced many instances of what he called Cardan's addiction to magic and the occult. One of them is taken from the seventh book [301] of *De Subtilitate*, called "De Lapidibus": an empiric physician from Tours possessed a remarkable loadstone which, if rubbed against a stylet, would impart to that instrument the power to penetrate human tissues without causing pain. Cardan repeated the experiment on himself. He sensed only a slight prick, and saw only a drop of blood at the site of the wound: ". . . il examine toutes les hypothèses qui se présentèrent à son esprit, pour expliquer par une supercherie ce prodige, sans qu'il put conclure à autre chose qu'à la réelle efficacité de cet aimant." [300] Incidents such as this led Durey [300] to regard Cardan as a hermetic physician of the circle of Arnaldus de Villanova (1235-1313?), Henry Cornelius Agrippa (1486-1535) and Paracelsus (1493-1541), a classification that had already been advanced by such writers as Hallam * [302] and Michéa [303] more than half a century previously. Kümmel [47] in 1910 continued the accusation of Durey: [300] "Vor allem bestätigen die medizinischen Bücher des Cardanus—denn mit dem Mathematiker und Physiker haben wir es hier nicht zu tun—dass er durch und durch Kabbalist war und Paracelsist."

What is necessary, however, is to view the man himself against the background of his time. When this is done, Cardan by no means stands out alone as a man much given to astrologic computations, excursions into the occult, and credence so far as familiar spirits are concerned. Great figures long before and after the age of Cardan indulged in the same fantastic flummery—as it appears to us today—as that for which the Milanese has been so roundly castigated. Long ago Owen [304] remarked that Roger Bacon (1214?-1294) "was a firm believer in the influence of the stars upon existing religions and their destinies." Forty years ago Thorndike [305] showed that Bacon, in his *De Secretis Operibus Artis et Naturae et de Nullitate Magiae*,[306] believed that the alchemist, provided with enough time and money, could devise a means with which to satisfy the expenses of the state by the conversion of baser metals into gold, and that the alchemist could prolong human life beyond the span allotted to it

* But Hallam nevertheless said that Cardan was a "man far superior to both Agrippa and Paracelsus." See reference 302.

by nature. It was demonstrated,[205] likewise, that Bacon accepted many of the principles of astrology. In the next century, the Cardinal Pierre d'Ailly (1350-1420), whose *Concordantia Astronomie cum Theologia* was printed by Erhard Ratdolt * at Augsburg in 1490, thought that God established astrology and theology as harmonious with each other, and suffered no evil consequences therefore. Tycho Brahe (1546-1601), as Dreyer [207] has shown, carried out astrologic computations, and thought the structure of the universe could be revealed by study of the stars or the elements, and that the future might in such wise be laid open to view. Jean Bodin (1530-1596) in his *République* [208]—called "perhaps the greatest book on political science written during the sixteenth century" [209]—wrote:

Et toutesfois [Bishop] Gauric n'a faict ny mise ny recepte de tous ces changements, & ne s'accorde aucunement ny avec les histoires, ny avec Cardan. Mais c'est bien mervueille que l'estoile de Cardan a eu tant de puissance d'ottroyer les Empires du monde en Italie, en Grece, en France, en Allemagne, lors qu'elle n'a esté verticale, & qu'elle n'a eu aucune puissance sur les Royaumes de Norvege, & de Suede, où elle est non seulement verticale le Soleil estant au midy au mois d'Aoust, ains aussi perpendiculaire, & neantmoins estoignee de Romme & de Constantinople en latitude de douze degrés pour le moins. Mais pourquoy Cardan donnera-il plus de puissance à ceste estoile là, qu'aux plus illustres? Pourquoy le Roitelet, ou le coeur du Lyon la plus grande qui soit, le Grand-chien, la Meduse, l'espi de la Vierge, le Vau tour, & autres infinies n'auront rien? il ne rend aucune raison.

But in spite of this skepticism directed at the astrologic work of Cardan, Bodin [208] had this to say of astrology:

Mais ce seroit chose infinie d'esplucher par le menu les Histoires, & toutesfois on pourroit par ce moyen recueillir la verité plus certaine, & conjecturer aucunement les changements des estats & Républiques qui peuvent advenir, avec l'usage des grandes conjonctions: autant que la science de telles choses peut avoir seureté: car de necessité il n'y on faut point chercher.

Torquato Tasso [210] (1544-1595) could write:

> As when a comet far and wide descried,
> In scorne of *Phoebus* midst bright heav'n doth shine,
> And tidings sad of death and mischiefe brings
> To mightie Lords, to Monarchs, and to Kings. . . . . .

The powerful line by Christopher Marlowe [211] (1564-1593): "See see where Christs blood streames in the firmament" † is followed eleven lines further by:

* Ratdolt as a matter of fact printed many works on astrology, at both Venice and Augsburg.

† The writer does not intend to suggest that the Elizabethan age was characterized

> You starres that raigned at my matinitie,
> Whose influence hath alotted death and hel,
> Now draw up Faustus like a foggy mist,
> Into the intrailes of yon labring cloude . . .

Examples such as these are plentiful in sixteenth-century literature almost everywhere in Europe. But there is much additional evidence of preoccupation with astrology, magic and the occult in fields other than letters. Albrecht von Wallenstein (1583-1634), for instance, was converted to belief in astrology by the horoscope that had been cast for him by Johann Kepler (1571-1630).[812] When John Chamber in 1601 published his *Treatise Against Iudicial Astrologie* . . . ,* Sir Christopher Heydon answered it in 1603 with *A Defence of Iudiciall Astrologie, In Answer to A Treatise lately published by M. Iohn Chamber* . . .* Sir Thomas Browne (1605-1682), who several times attacked Cardan on various scores, testified at a trial that he believed in the reality of witchcraft.[812] The mellow John Evelyn (1620-1706), a man justly honored for his sagacity and acumen, nevertheless could write [812] in 1681:

> We have late had several comets, which, though I believe appear from natural causes, and of themselves operate not, yet I cannot despise them. They may be a warning from God, as they are commonly forerunners of his animadversions.

In our own country, long after the age of Cardan, the record in respect to ignorant credulity and superstition is none too bright. Increase Mather (1639-1723), president of Harvard College and a man of uncommon attainments, preached a sermon in 1680 on *Heaven's Alarm to the World, wherein is showed that fearful sights and sounds in heaven are the presages of great calamities at hand.*[812] His own son, Cotton Mather (1663-1728), having lost one of his manuscripts, swore that "Spectres, or Agents in the Invisible World, were the Robbers."[812] Physicians in the New World a century after the time of Cardan were fully as superstitious as the Milanese ever was. Wertenbaker [813] has shown that:

by superstition and absence of genuine learning to the exclusion of much real progress. A good source on this question is: Doran, Madeleine: On Elizabethan "Credulity," with Some Questions Concerning the Use of the Marvelous in Literature. *Journal of the History of Ideas* 1:151-176 (April) 1940. For the preceding century, see: Stearns, M. W.: The Planet Portraits of Robert Henryson. *PMLA* 59: 911-927 (Dec.) 1944.

* These two works the writer has not seen. They are described in catalogue No. 584 (1941) of Bernard Quaritch, Ltd., of London, in which they are described as being bound together in one small quarto volume. The first work is said to be dated 1601, and the second, 1603.

The medical profession should have been foremost in pointing out the folly of the belief in witchcraft, but unfortunately it often lent its support to the delusion. Many a physician, when his decoctions failed to bring relief, excused himself by complaining that the patient had been bewitched. Few seemed to have had any conception of the real nature of insanity or of epilepsy, and the ancient theory of demoniacal possession was generally accepted.

Cardan's remarks concerning his familiar spirits, together with his attempted horoscope of Jesus Christ, still influence some comparatively modern commentators, such as Marie,[514] who, after calling Cardan " pas trop honnête, un peu astrologue, un peu charlatan, un peu athée et un peu cafard," finally dismissed him thus: " Si Cardan était un homme supérieur, il serait intéressant de connaître les fautes dans lesquelles il est tombé; mais ce n'est pas le cas." This was in 1883. Yet both Naudé [20] and Nicéron,[28] years previously, had specifically absolved Cardan of the charge of belief in a familiar spirit or genie. Naudé wrote: [20]

D'où l'on peut juger asseurement, pour conclure ce Chapitre, que lui [Cardan] & Scaliger n'ont point eu d'autre Genie que la grande doctrine qu'ils s'étoient acquis par leurs veilles, par leurs travaux & par l'experience qu'ils avoient des choses sur lesquelles venant à élever leur jugement, comme sur deux colomnes ou pyramides, il jugeoient pertinemment de toutes matieres, & ne lassoient rien échapper qui ne leur fust conneu & manifeste.

The testimony of Nicéron [28] was similar:

Il [Cardan] croyoit qu'il étoit sous la direction d'un genie particulier, comme il paroît par le 47. chapitre de sa vie. Il n'avoit pas cependant sur cet article des sentiments bien fixes, non plus que sur bien d'autres choses; car quoiqu'il marque dans son Dialogue intitulé: *Tetim*, qu'il en avoit un qui étoit Venerien, mêlé de Saturne & de Mercure, & dans son Livre *de libris propriis*, qu'il se communiquoit à lui par les songes; il doute dans ce dernier Livre, s'il en avoit veritablement un, ou si ce qu'il prenoit pour un genie étoit l'excellence de sa nature; & décide même dans son Ouvrage *de rerum Varietate*, qu'il n'en avoit point: *Ego certe nullum Daemonem aut Genium mihi adesse cognosco.*

The relationship of Cardan's preoccupation with astrology, magic and the occult likewise has stimulated much speculation in the literature on the Milanese. The writer frankly is not concerned by the question of whether Cardan was or was not an atheist. But the charge that he was has caused great consternation in the minds of others. Nicéron [28] actually explained Cardan's superstition on the basis of his deep piety:

Plusieurs l'ont traité d'Athée; mais il est facile de voir qu'il y avoit plus de Fanatisme que d'Atheisme dans son fait. On ne peut nier qu'il n'y ait dans ses Ouvrages plusieurs choses mauvaises & dangereuses; mais on y en trouve bien

davantage, qui sont conformes à la saine Doctrine, que la Religion nous enseigne. Il paroit par tout attache aux exercices de la pieté, qu'il poussoit quelquefois jusqu'à la superstition.

The defense of Cardan in matters of religion as presented by Lessing [31] has already been described herein. Lessing's conclusion [31] was endorsed in 1919 by Charbonnel,[315] who in a long consideration of Cardan's attachment to astrology, remarked: "Bien que Cardan rattache à l'influence des astres la naissance du Christ, celle des diverses religions et les vicissitudes de la lutte qui s'est poursuivie entre elles, il garde toutes ses sympathies au christianisme triomphant . . ." Hefele [316] seemed fully convinced that Cardan was a good churchman:

Cardanos soziale und politische Anschauungen sind von den gleichen Gedanken beherrscht wie sein wissenschaftliches Streben und sein persönliches ethisches Verhalten: von Einheit und Klugheit. Er war und blieb Katholik, nicht nur unter dem Drucke der drohenden Inquisition, sondern als echter Italiener aus gesunden sozialen und konservativen Instinkten. Er war in kirchlichen wie in staatlichen Dingen Absolutist, weil er die von ihm geforderte zusammenfassende Einheit, auf das politische Gebiet übertragen, nur in der Monarchie strengster Ordnung möglich sah und weil er fühlte, wie sehr die Religion imstande sei, diese politische Einheit zu fördern und zu stärken.

The writer has had occasion to examine the first edition (1554) of the work cited by Brucker,[30] Lessing [31] and others [28, 32] as containing the horoscope of Christ. The horoscope is found in the ninth chapter of the volume; [317] moreover, it is accompanied by a woodcut of the geniture of Christ, who Cardan thought was born six years after the great conjunction in Aries. The same horoscope was included by Spon in his edition of the collected works of Cardan.[318] The volume of 1554 is, of course, filled with astrologic lumber of all kinds, most of which is perfectly unintelligible. Cardan said [319] that various planets and celestial triangles exercise an action on the origin and development of the several religions in one region or another of the earth, that the celestial triangles have adversaries in the form of other triangles, and that religions formed under the influence of certain triangles will attack religions formed under other triangles. It is indicative of the credulity of the age of Cardan, as much as it is of the superstition of Cardan, that such mumbo jumbo should be regarded seriously enough to endanger the personal fortunes of its author. Whether or not the horoscope of Christ and the accompanying material are impious will depend, of course, upon the reactions of the individual reader. Curiously enough, however, there is a link between the credulity and superstition of Cardan which extends down through the centuries to our own

times: the celebrated English astrologer, William Lilly (1602-1681), included what he called the "Choicest Aphorisms of the Seven Segments of Jerome Cardan of Milan" [820] in his *Astrologer's Guide* of 1675. The *Astrologer's Guide* [820] was reprinted in 1886, and Lilly's *Introduction to Astrology* [821] was re-issued in the United States as recently as 1935. It can be assumed that the book was republished because there was some demand for it, even in our age.

The writer, for his part, is wholly unable to state whether Cardan was or was not a devout churchman. He does not know of any means by which the truth could be ascertained beyond any question of doubt. The age of Cardan is too remote from the present to enable anyone to establish the nature of a man's religious convictions when the only evidence available is a few fleeting allusions to matters of religion in that man's writings. It is a fact that Cellini in his autobiography referred to his personal piety much more often than Cardan spoke of his own devotion in his *De Vita Propria Liber*. But this is of no great significance, although it does tend to suggest a certain degree of indifference toward things of the spirit on the part of the Milanese. Resort to the literature on Cardan is not much more helpful. Almost any desired judgment can be obtained therefrom, ranging from the recriminations of De Thou,[15] Del Rio [16] and Naudé,[17, 18, 19] to Durey's statement [800] that Cardan did believe in an intermediate agent between God and material substance, an agent which the Milanese regarded as *spiritus*,* in the sense that Roger Bacon, Arnaldus de Villanova and Cornelius Agrippa used the word. Finally, for example, one can find such a statement as: "The absurd report that he [Cardan] was an Atheist does not deserve a notice; and though he loved to speculate with the philosopher, he detested heretics." [88]

The writer suspects that many of Cardan's actions as they applied to religion were governed by the fact that he lived in the environment of the Counter Reformation, in close proximity to the world center of adherents of the Roman faith. Yet, as shown previously, there is no convincing evidence that he ever suffered severely at the hands of the church or that he blamed the church for his plight when he was removed from the University of Bologna in 1570 and advised to go to Rome. The great blight of his life, to judge from what he wrote of his own emotions, was the execution of his son, Giambattista, in 1560. Somber preoccupation with the bitter memories of this tragedy pervades the *De Vita Propria*

* The reader probably will agree that it would be almost impossible to obtain a modern and exact equivalent of this term. The writer cannot define it.

Liber to the relative exclusion of comparable concern for any other member of Cardan's family, including his wife and his mother. But he who seeks in the same book signs of devotion to religion on the part of Cardan will seek in vain. Hefele's assertion [216] that Cardan was and remained a faithful Roman Catholic because of his solid social and conservative instincts, rather than because of his respect for the Inquisition, must be based upon evidence that has not been available to the writer. Owen,[222] by contrast, seemed convinced that Cardan was a freethinker; yet, his statement that Cardan's writings were lascivious,* [223] like the statement of Hefele [216] *supra*, must be based upon material which this writer has not seen.

One of the most amazing aspects of the literature on Cardan is the fact that arguments as to his sanity or insanity have persisted even to this day. It must be said that there was every reason why, in his own century, Cardan should have been looked upon as a very queer fellow indeed. Those who have excelled in the arts or sciences have been accorded such attention for centuries. Almost two thousand years before the age of Cardan Plato [224] declared that the sane mind knocks in vain at the door of poetry. Aristotle's query [225] as to why all such men as have been superior in philosophy or politics or poetry or the arts appear to have been melancholy is well known. So also is Horace's line [226] in the twelfth ode of the fourth book of odes: "Dulce est desipere in loco." Seneca,[227] in his work on tranquillity, fortified such contentions when he said that the lofty utterance which rises above the attempts of others is impossible of creation unless the mind is excited. And a distinguished English commentator [228] of the nineteenth century might well have added the name of Cardan when he wrote: "Depression is, as all students know, the invariable concomitant of severe intellectual work; and if not resisted may easily lead to a systematic contempt for existence, such as that displayed by Petrarca, Machiavelli, and Guicciardini. . . . I need not add that, when strongly marked, it is often a precursor of cerebral disease."

* Cardan has been much assailed for his riotous life and unlicensed venery, especially when he was a student at the University of Padua. These defects he himself freely admitted. They were defects, however, which were also part of the social fabric of the age. Volpati, for instance, has shown that feminine morality in Venice at about the time Cardan was at Padua was very low indeed. The well-known historian of Venice, Pompeo Gherardo Molmenti (1852-1928), has shown that immorality in Venice during the age of Cardan extended even to segments of the church. See: Volpati, Carlo: Paolo Giovio e Venezia. *Archivio Veneto* 15 (new series): 132-156, 1934. See also: Molmenti, Pompeo: *La storia di Venezia nella vita privata dalle origini alla caduta della Repubblica.* Bergamo, Istituto Italiano d'Arti Grafiche, 1906, ed. 4, vol. 2 [Lo splendore], pp. 585-624.

Speculation as to the sanity of Cardan could not have been influenced favorably by his known labors in the realm of astrology and the occult. Larrey [329] said that after Cardan's prediction concerning the fate of Archbishop Hamilton was supposed to have been fulfilled,* " Il ne faut pas s'étonner après cela si quelques Historiens, les Ecossois principalement, traitent Cardan de Magicien." Even the University of Padua, from which Cardan had been graduated, was not free of suspicion. Libri [197] said that " Aux universités de Bologne et de Padoue, la chaire d'astrologie était considerée comme l'une des plus nécessaires . . ." Scott [330] was sufficiently aware of the reputation of Padua in this respect to write, in the " Lay of the Last Minstrel ":

> He learned the art that none may name
> In Padua, far beyond the sea.

In his notes to the same work, Scott [330] observed: " Padua was long supposed, by the Scottish peasants, to be the principal school of necromancy."

Hence, when such a commentator as De Thou [15] leaves behind a picture of Cardan as a man dressed differently from everyone else, who could not converse as other people did, who in some matters had less understanding than a child, and who was so utterly unbalanced as to attempt to cast the horoscope of Christ, it is not difficult to see why subsequent writers should consider the Milanese to be crazy. The charge has undergone many changes during the centuries since the time of De Thou. The unfavorable judgment of Naudé [182] likewise has been much employed, to the great detriment of Cardan. Figuier [331] asserted that Gottfried Wilhelm Leibnitz (1646-1716) had regarded Cardan as *fou*; but, on the other hand, there is a contrary statement by Leibnitz [332] himself: " Je n'entends pas un simple savoir des faits, sans celui des raisons, mais tel que celui de Cardan, qui étoit effectivement un grand homme avec tous ses défauts, & auroit été incomparable sans ces défauts."

Another observer [41] compared Cardan with Immanuel Kant (1724-1804) because he thought that Cardan sought to explain all things on the basis of the stars, whereas Kant, in his old age, was said to have searched for similar explanations in electricity. Both men, it was claimed,[41] were troubled by terrible dreams.† Cardan ostensibly was guided by the church,

* It was not fulfilled, by any means. It was incorporated in Cardan's horoscope of Archbishop Hamilton, which occupies pages 413-416 of the work indicated by reference 317. Study of this horoscope will show that Cardan's prediction, in the light of the real fate of the Scotch Churchman, was almost wholly incorrect.

† Singer has made an interesting comparison in this respect. Writing of Hildegard of Bingen (1098-1179), he said: " The condition from which she was suffering was clearly a

but actually put his faith in astrology; Kant was declared [41] to be guided by pure reason, but ". . . s'abandonnait quelquefois à des égarements qui tenaient de la démence et il s'épouvantait à l'aspect de ces feux follets auxquels le simple bon sens lui défendait de croire." Lélut [388] provided another version when he said that Cardan, like Plato, thought he had the assistance of a demon or familiar spirit. This belief, Lélut [388] said, was common among those who were followers of the Alexandrine school of philosophers. He concluded: "Il [Cardan] a écrit l'histoire de sa vie et de son esprit familier un an environ avant sa mort, et à cette époque il était plus halluciné, plus fou que jamais, ainsi que son ouvrage tout entier en fait foi." Lombroso [89] mentioned Cardan's familiar spirit, and professed to have found evidence of monomania, hallucinations and unfavorable psychic effects arising from Cardan's early impotency, but Lombroso, as is well known, actually was interested not so much in Cardan as in justifying a particular concept of his own, now largely ignored. Rivari,[46] who for some time was assistant professor of psychiatry in the University of Padua, reported in 1906 that he had encountered instances of sensory, motor and secretory alterations in the constitution of Cardan, on the basis of Cardan's writings, and that he had also noted indications of hallucinations, sensations of persecution, delusions of grandeur, belief in a familiar spirit and in premonitions, and certain considerations which have to do with criminal anthropology.*†

functional nervous disorder . . . At first sight the long procession of figures and visions suggests that she might have been the victim of a condition similar to that of which Jerome Cardan has left us so complete a personal record. But on reading the books of visions the reader will easily convince himself that we are not here dealing with a dream-state. The visions are indeed essentially vivid." See: Singer, Charles: *From Magic to Science. Essays on the Scientific Twilight.* London, Ernest Benn, Ltd., 1928, p. 231.

* The celebrated remark concerning Cardan by Hermann Boerhaave (1668-1738) often has been ignorantly attributed to Albrecht von Haller (1708-1777) simply because it appeared in a book by Haller. It is usually quoted out of context, as: "Sapientior nemo, ubi sapit, dementior nullus, ubi errat." The context is: "Commendo hic HIERONYMUM CARDANUM, Mediolanensem medicum, mirificum illum scriptorem, quo, uti dicit eruditissimus quidam scriptor, sapientior nemo, ubi sapit, dementior nullus, ubi errat." The complete reference is: *Hermanni Boerhaave Viri Summi, Suique Praeceptoris Methodus Studii Medici Emaculata & Accessionibus locupletata ab Alberto ab Haller.* Amsterdam, sumptibus Jacobi a Wetstein, 1751, vol. 1, p. 692.

† In his study of 1927, Dayre seemed to think that Cardan was a victim of cyclothymia, which in the United States is generally understood to be a mild type of manic-depressive psychosis, with recurrent manic and depressive phases. Dayre based this opinion on the writings of Achille-Delmas and Boll, and De Fleury. For Dayre's study, see: Dayre, Jean: Jérôme Cardan (1501-1576). Esquisse Biographique. *Annales de l'Université de*

The question of Cardan's sanity or insanity has not escaped inquiry in our own country. Burr [52] in 1917 remarked:

> To an alienist the first question always is, was Cardan insane? In his own time many so regarded him—friends as an inspired imbecile, enemies as just an imbecile. Few held the balance even while forming judgment. For years after his death men who wrote of him also regarded him as more or less insane because of the qualities which we of today regard as proof of sanity, and sane because of things we regard as proving insanity. So changes the world's point of view. The difficulty in settling the question is to find a test of sanity.

Burr [52] was not willing to say that Cardan's mind was unsound throughout his life:

> In other words, whether an act or thought is sane or insane depends upon latitude, longitude, race and time. The African negro who believes in ghosts is sane, the twentieth century American who does so is not, or rather was not, because many people seem to be reverting to primitive ideas. Socrates had a demon and was sane; many who so claim today are simply humbugs. Now following our rule, Cardan was not insane till old age.

Auden [55] in 1929 was even more cautious; he thought Cardan had an inferiority complex which had an origin in the severe beatings which Cardan had received as a child. Such a complex *per se* thus far has not been taken to be an indication of insanity. There were, however, some evidences of fantasy in the writings of Cardan:

> By nature timid, afraid of thunder, firearms, swords, swimming and riding, he found compensation in roaming about the streets at night, disguised and armed, despite the drastic prohibitions of the civic authorities. Here, indeed, is a good example of fantasy-building, wherein his conscious shrinking from danger and his lack of self-confidence found compensatory expression in the fantasy of being a bold and venturesome swashbuckler.[55]

The writer does not wish to be set down as a champion of Cardan, for he has no objective in the present study other than to arrive at an approximation of the truth in respect to Cardan and his achievements. But to him the difficulties of judging the mental competence of a man dead 370 years, on the basis of the man's written works and the testimony of those who lived in an age steeped in superstition and credulity, seem insurmountable. Virtually all the testimony in this respect must be classed as hearsay. Much

Grenoble [section lettres-droit] 4 (new series): 245-355, 1927. For the authorities referred to by Dayre, see: Achille-Delmas, François, and Boll, Marcel: *La Personnalité humaine. Son analyse.* Paris, Ernest Flammarion, Publisher, 1922, pp. 43-46; and De Fleury, Maurice: A la recherche des facultés de l'âme. *Revue de France* 1: 87-118 (Jan. 1) 1926.

of what appears in modern histories of mathematics and science, as Bortolotti [883] and Miller [884] declared, is based upon nothing more than the gradual accretion and subsequent distortion of such hearsay evidence during the centuries since the death of Cardan. That Cardan, by his own indications, was irascible, devious, scheming, suspicious and none too honest can be denied by no one who has examined his works. But to say that he was also insane would require a perspicacity which this writer does not possess. On the basis of what he has read of Cardan's works, the writer is inclined to agree with Crossley [25] that "If Cardan was mad Rousseau was," and to endorse the protest of Figuier: [881]

> Ce [Cardan] fut un savant de premier ordre, qui, malheureusement, demeura, pendant toute sa vie, aux prises avec la pauvreté et l'infortune, et en même temps, accablé sous le poids constant des souffrances physiques. Il est vivement à désirer que ces fausses appréciations, tirées d'anciens auteurs, soient abandonées, et que le philosophe de Milan n'apparaisse devant la postérité qu'avec ses malheurs et son génie.

This is an opinion which the writer would not seek to impress upon anyone. In the study now concluded he has endeavored to resort, not only to the works of Cardan, but also to the writings of as many commentators on Cardan as possible. To his knowledge, no unfavorable testimony has been suppressed; he hopes that at the other extreme the evidence adduced has not been too sanguine. An attempt was made to adhere to the caution of Gibbon: [886] ". . . I cannot determine what I ought to transcribe, till I am satisfied how much I ought to believe." The reader will have perceived that much of what has been written about Cardan since his death is contradictory, vague, sometimes extravagant, sometimes false, often malicious, and frequently downright adulatory. There is, however, still another pitfall into which the investigator of Cardan and his works may easily stumble. It was described by Thorndike [885] forty-one years ago. He was speaking of the age of the Roman Empire, but his words apply fully as well to the age of Cardan:

> Have we a right to attribute to the minds of that age our definiteness and clarity of thought, our common sense, our scientific spirit? Is it fair to take the words in which they expressed their thought and to interpret these according to our knowledge, our frame of mind; to read into their words our ideas and discoveries; to rearrange their disconnected utterances into systems which they were incapable of constructing; to endeavor by nothing else than a sort of allegorical interpretation to discover our philosophy, our science, our ideals in their writings? Have not even words a greater definiteness and value now than once? When we translate a passage from an ancient language are we not apt to transfigure its thought?

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